

# The Iron Age

A Review of the Hardware, Iron and Metal Trades.

Published every Thursday Morning by DAVID WILLIAMS, No. 83 Reade Street, New York. Entered at the Post Office, New York, as Second-Class Matter.

Vol. XXX: No. 14.

New York, Thursday, October 5, 1882.

\$4.50 a Year, Including Postage.  
Single Copies, Ten Cents.

## A Year's Work with the Emery Testing Machine.

Col. T. T. S. Laidley, commanding Watertown Arsenal, and in charge of the United States testing machine there, has submitted to the Chief of Ordnance his report of the tests of metals and other materials made by the Government during the past fiscal year. The work done comprises tests upon the resistance of cast-iron cylinders to internal pressure, the resistance of iron floor beams to flexure under permanent and variable loads, experiments with iron truss columns of different pattern, tests of construction timber and of several kinds of wood from the Pacific slope, &c.

The report, in summarizing the work done, gives most prominence—and deservedly so—to Colonel Laidley's own experiments with cast-iron cylinders. The method of investigation in these experiments is so well devised, all the attending circumstances so carefully noted, and the results obtained so important and remarkable, that we have no doubt our readers will welcome their full recital in these columns.

These experiments were first proposed by Colonel Laidley in 1877, to the United States Board for Testing Iron and Steel, but remained among the "unfinished work" of this august and now defunct body. The purpose of these experiments was to throw additional light on the construction of guns, and particularly the conversion of smooth-bore guns into rifles, as practiced by the Ordnance Department.

The specimens, in order to make the experiment the more satisfactory, were made as large as could be broken by the testing-machine. With this purpose in view, eight cast-iron hollow cylinders, 11 inches in diameter and 22½ inches long, were designed, which it was proposed to burst by resting the closed end against a firm support and forcing a closely fitting piston into the bore, previously filled to a certain depth with beeswax, and noting the strain required to be applied to the piston to burst the cylinder. In order to prevent the entrance of the wax into the cracks of the cast iron, the bores were lined with thin copper tubes, as is frequently done in hydraulic presses.

Three cylinders, 8 feet long and 1 foot in diameter, were cast on end in dry sand, at the South Boston Foundry, from the same furnace of metal, this being what is known as gun-iron. Six pieces, each 22 inches long, were cut from the lower part of two of these cylinders and marked, commencing at the lower end of the first cylinder, A 1, A 2, A 3; and of the second cylinder, B 1, B 2, B

marked C, to 4.3 inches. The A cylinders were lined with copper tubes 1-10th inch thick; those marked B, with wrought-iron tubes 9-10th inch thick, made at the West Point Foundry in the same manner and of the same iron as that used in making tubes for the large rifled guns; the C cylinders

screwed in cylinders B and C, and merely dropped in A. The tube of C 3 had four longitudinal cuts, 6 inches long, made near the lower end to destroy its longitudinal resistance; by this means the amount of work performed by the cast iron alone, without the assistance of the tube, was determined.

of the testing machine, and the force applied to the piston, noting the enlargements of the cylinder and the distance to which the piston was forced in. When the strains reached 400,000 or 500,000 pounds, a strong wrought-iron casing was placed around the cylinder, secured by bolts, and the strains increased

moved, and after having been carefully measured, the bore was continued through the breech, of the same size, and closed by a cast-iron breech screw. New linings were inserted, and the bore of A 1 was enlarged to a uniform size of 3.4 inches.

The first wax-check used in A 1 was made of steel, and the great enlargement of the bore under heavy strains caused it to be broken; this allowed a slight escape of wax around the piston, interrupting its free motion and vitiating the results. The permanent enlargement of the bores of cylinders A 1 and A 2, after the first trials, was 0.187 inch and 0.11 inch respectively. C 3 was first tested without any lining tube. A strain of 800,000 pounds on the piston failed to burst it, the pressure per square inch being 55,088 pounds. The surface of the bore exposed to pressure was 153.27 square inches, as compared with 115.7 square inches in the case of C 1 and C 2. The bore was permanently enlarged by this means 0.096 inch, and the diameter of the exterior 0.059 inch. The tube was then inserted and the pressure applied till the cylinder gave way. It was originally intended to preserve the length of bore subjected to pressure exactly the same at all stages of the test, but it was found that to do so would involve a greater expense than the advantages gained would seem to warrant. The cylinders lined with wrought iron and bronze enlarged more before breaking than those with the very thin linings, and consequently the length of the column of wax was thereby shortened by equal strains to a greater extent than in those last named. This condition made the tests more favorable for the resistance of those cylinders than if the column had been maintained of the same length in all. Wax under strains of 60,000 pounds per square inch has its volume diminished by the compression 11.6 per cent. The steel piston 10.5 inches in length was shortened 0.056 inch under a strain of 800,000 pounds. The rupture of a cylinder was attended by a loud report which was heard to a considerable distance. Fragments were thrown with such force against the wrought-iron casing as to crack it, though made of five-eighths-inch iron. The appearance of the fractures and the grain of the metal, together with the tests afterward made, show that the iron was of good quality, a little softer than would be ordinarily used in guns. Its tensile strength is 30,000 pounds.

The lines of fracture of the cylinders A 1, B 2, and C 3 are well shown in Figs. 1, 2 and 3, which are reproduced from photographs taken soon after the cylinders were broken. Colonel Laidley claims that these experi-

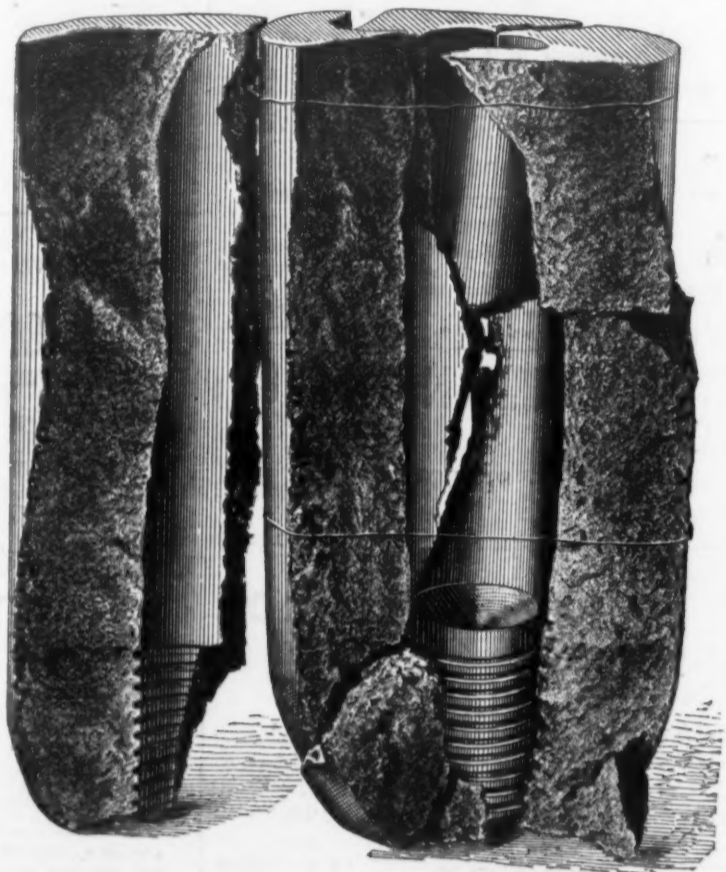


Fig. 1.—Fracture "A 1," Referred to in Colonel Laidley's Report, from a Photograph. Copper Lining 1-10th Inch Thick. Bursting Strain, 769,200 Pounds.

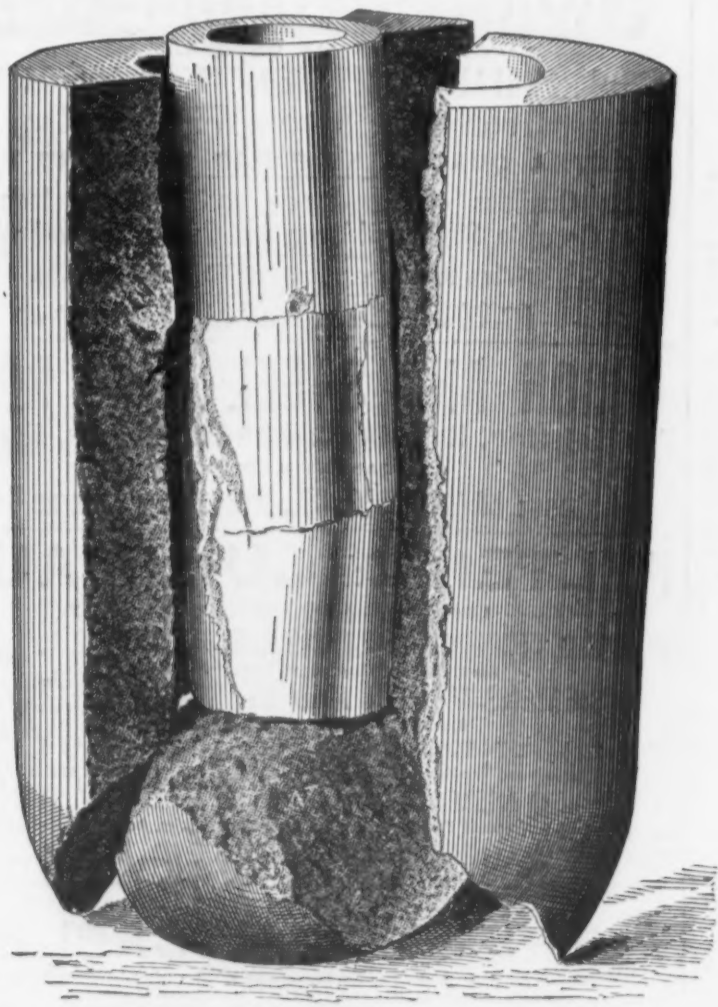


Fig. 2.—Fracture "B 2," Described in the Report, from a Photograph. Wrought-Iron Lining 9-10ths Inch Thick. Bursting Strain, 687,900 Pounds.

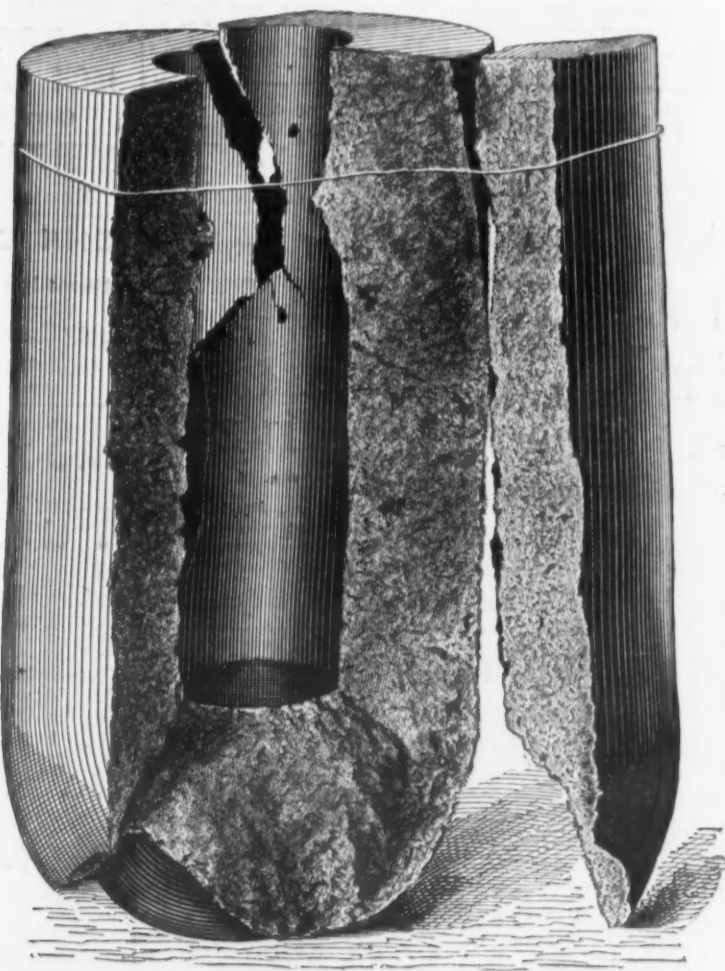


Fig. 3.—Fracture "C 1," from a Photograph. Bronze Lining ¼ Inch Thick. Bursting Strain, 735,400 Pounds.

A YEAR'S WORK WITH THE EMERY TESTING MACHINE.

3; and from the third cylinder, C 1, C 2. In order to guard against accidents that might happen in casting or finishing these eight pieces, an extra one was prepared, C 3. They were all turned to the same diameter, and bored out as shown in Figs. 4, 5 and 6; three of them marked A, to 3.5 inches; another three marked B, to 5.1 inches; and three

were lined with bronze tubes ¼ inch thick, condensed; the first by a pressure of 28,000 pounds per square inch, the tube being secured in a strong iron mold; and the second by forcing a series of mandrels through the bore, according to the Dean process. The tubes were all turned to fit the cast iron closely, and one end closed with a flat disk,

A closely fitting thin brass cup was first inserted, and pushed to the bottom of the bore; melted beeswax was then poured in, to a depth of 10 inches, and permitted to cool. A copper wax check (Fig. 7) was next inserted, then a steel piston 10.5 inches long, nearly filling the bore. The closed end of the cylinder was placed against the platform

until the cylinder was burst. Owing to the upset of the piston in the first tests of cylinders A 1 and A 2, by which the friction against the sides of the bore was increased, thereby diminishing, to a considerable extent, the pressure upon the wax and upon the walls of the cylinder, the results were not satisfactory; the copper linings were re-

ments prove conclusively that a cast iron cylinder is not strengthened, but on the contrary weakened, by enlarging the bore and replacing the cast iron thus cut away by a coiled wrought iron or brass tube; that this loss of strength in the cylinders tested was about 18 per cent. for those lined with wrought iron; that a cylinder is weakened

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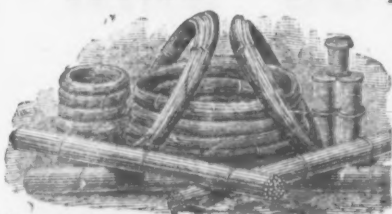
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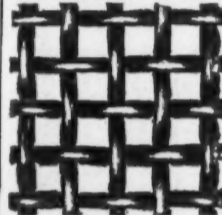
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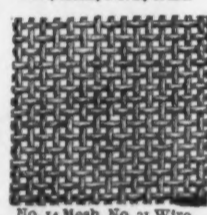
No. 4 Mesh, No. 14 Wire.



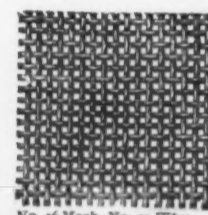
Wire Cloth, partly  
unrolled.



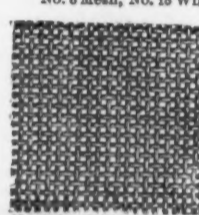
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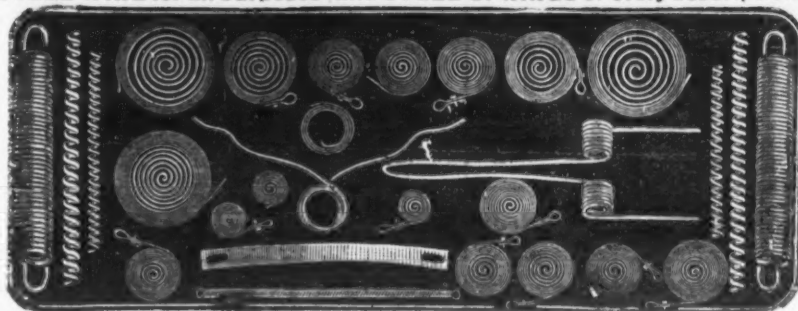
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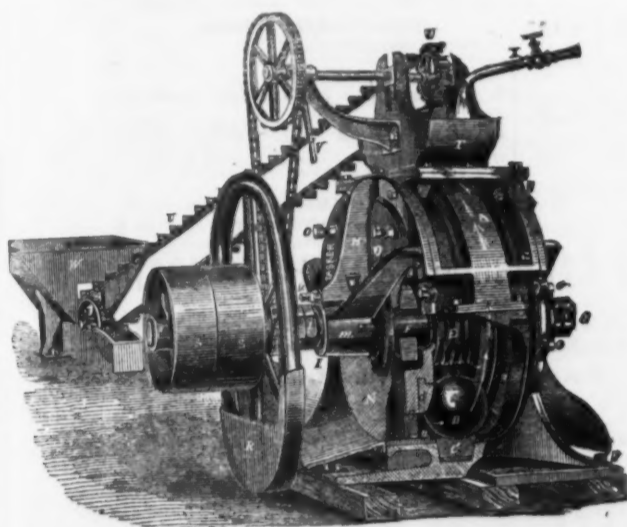
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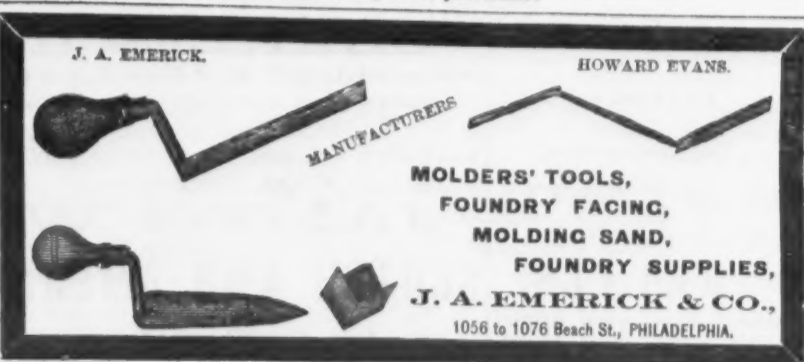
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by having the bore continued through the  
solid breech and afterward closed by an iron  
plug screwed in, and finally that the strength  
of the several cylinders is in direct propor-  
tion to the area of cast iron in the longi-  
tudinal section through the axis of the cyl-  
inder. We think this claim too strong for  
the small number of experiments made, but  
hold that they prove conclusively the neces-  
sity for further investigation in the direction  
indicated, as the results here obtained are  
not only of great interest to the Ordnance  
Department, but also to a great number of

center, and brick arches 4 inches thick  
thrown from beam to beam. The top sur-  
face was leveled with concrete, and a floor  
of 2-inch plank laid upon it. A sheet-iron  
tank of the size to cover the floor, and 6 feet  
high, was placed on the floor, filled with  
water to different depths, and the deflection  
of the beams carefully noted. The water  
was then drawn off, and the amount of per-  
manent set given to the beams by each suc-  
cessive load thus determined. Other simi-  
lar beams were tested by dead loads applied  
in the center, the beams being unsupported

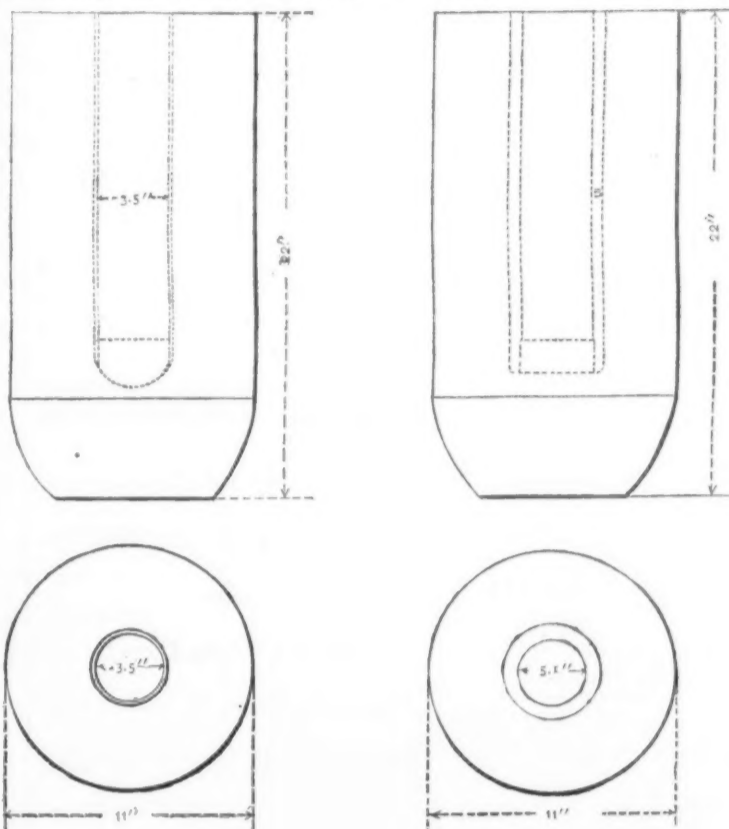


Fig. 4.—Diagram of an "A" Cylinder.

Fig. 5.—Diagram of a "B" Cylinder.

THE EMERY TESTING MACHINE.

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turing interests.

In order to show the correspondence be-  
tween the static strains of the testing

laterally. The loads and corresponding  
deflections up to the point of failure are col-  
lated in a series of tables, which we do not  
reproduce here, as they have hardly any

TABLE A 1.—DIMENSIONS OF CYLINDERS.

Distinguish- ing marks.	Total length.	External diameter.	Internal di- ameter of cast iron.	Depth of hole in cast iron.	Thickness of lining.	Diameter of bore.
A 1.	22.50	10.998	3.506	17.13	.70	3.306
A 2.	22.50	11.000	3.507	17.14	.70	3.307
A 3.	22.50	10.997	3.505	17.09	.70	3.305
B 1.	22.00	11.000	5.110	16.50	.912	3.286
B 2.	22.00	11.000	5.110	16.50	.912	3.287
B 3.	22.00	10.999	5.114	16.50	.914	3.286
C 1.	22.00	10.998	4.313	16.50	.512	3.287
C 2.	22.00	10.995	4.300	16.50	.508	3.284
C 3.	22.00	11.004	4.303	16.50	.510	3.286

machine and those exerted by the ex-  
plosion of gunpowder, two 3.2-inch cast-  
iron guns, weighing 931 pounds and 955  
pounds respectively, and cast from the  
same pool of metal, and finished to the  
same dimensions, were procured and fired  
to extremity. One was simply a cast-iron gun  
without any lining; the other was lined with  
a coiled wrought iron tube, made at West  
Point Foundry, of the same materials, in the  
same manner and with the same care as is

practical value at all in the form in which  
they are presented. The transverse strength  
of a rolled eye-beam depends upon its cross-  
section as well as the quality of the iron.  
All our leading mills, such as Carnegie Bros.,  
Cooper, Hewitt & Co., Clarke, Reeves & Co.,  
&c., issue handbooks in which the strength  
of their beams is stated, based upon careful  
calculation of the moments of inertia of the  
sections and the allowed extreme fiber stress.  
Architects and builders are almost entirely

TABLE A 2.—CYLINDER TESTS.

Distinguish- ing marks.	Maximum enlargement of external diameter under loads of							
	150,000 pounds.	200,000 pounds.	250,000 pounds.	300,000 pounds.	350,000 pounds.	400,000 pounds.	450,000 pounds.	500,000 pounds.
A 1.	.001	.001	.001	.001	.001	.001	.001	.001
A 2.	.001	.001	.001	.001	.001	.001	.001	.001
A 3.	.001	.001	.001	.001	.001	.001	.001	.001
B 1.	.001	.001	.001	.001	.001	.001	.001	.001
B 2.	.001	.001	.001	.001	.001	.001	.001	.001
B 3.	.001	.001	.001	.001	.001	.001	.001	.001
C 1.	.001	.001	.001	.001	.001	.001	.001	.001
C 2.	.001	.001	.001	.001	.001	.001	.001	.001
C 3.	.001	.001	.001	.001	.001	.001	.001	.001

used in making tubes for converting smooth-  
bore guns into rifles, and represented to a  
scale of four-tenths a converted rifle of the  
latest model. The cast-iron gun proved  
itself the strongest, and the ratio of its  
superiority over the lined gun was about the  
same as shown in the experiments above  
described, and detailed in the accompanying  
tables A 1, A 2, A 3 and A 4.

Following next in order, the report contains  
the records of tests of wrought-iron I beams.  
It appears that the board for testing iron,

guided by these handbooks in the use of  
floor beams, and these Government tests, to  
have any value whatever, ought to have  
either verified the published tables of the  
different mills, or shown where modifications  
of the same were suggested by the results of  
the tests. But as the tables in Colonel  
Laidley's report simply give loads and cor-  
responding deflections, one would have to re-  
calculate the whole tests in order to find out  
what they demonstrate. Life is too short for  
that sort of work, and as long as the Govern-

TABLE A 3.—CYLINDER TESTS.

Distinguish- ing marks.	Under initial load of 5,000 pounds on piston.			Unlimited loads.	
	Length of bore filled with wax.	Surface of bore exposed to wax.	Volume of wax.	Actual.	Internal pressure per square inch.
A 1.	Inches.	Square inches.	Cubic inches.	Pounds.	Pounds.
A 2.	2.878	111.10	84.65	80,000	93,144
A 3.	2.833	95.12	71.47	80,000	93,144
B 1.	10.445	117.03	89.62	722,500	82,366
B 2.	10.097	122.71	85.62	635,500	74,936
B 3.	10.010	118.81	84.88	687,900	81,120
C 1.	10.471	116.57	88.79	665,200	77,823
C 2.	10.388	115.71	88.09	735,400	86,712
C 3.	10.385	115.61	87.96	698,100	82,422
A 1.	10.064	123.00	86.23	769,200	89,518
A 2.	10.371	116.37	89.13	437,600	55,267
C 3.	10.388	115.49	87.78	599,000	70,865

\*Diameter of bore considered to be 3.303 the interior diameter of the lining.  
\*Diameter of bore considered to be 3.308 the interior diameter of the lining.

steel and other metals, had left on hand a  
number of these beams, which it had intended  
to test under the same circumstances in  
which they would be used for the floors of  
buildings.

Colonel Laidley carried this intention into  
effect in the following unique manner: Two  
parallel walls were built 4 feet high, 28.5  
feet apart; on these five 15-inch beams were  
placed 7 feet 4.8 inches apart from center to

ment pretends to make tests of general public  
interest, they might as well work out their  
results themselves, especially as the Govern-  
ment has certainly more leisure than a  
practicing engineer. The same criticism  
applies to the column tests. The tables  
ought to give the calculated strength of the  
columns according to Gordon's and Ran-  
kine's formulas, then the results of the  
tests would show what, if any, modifica-

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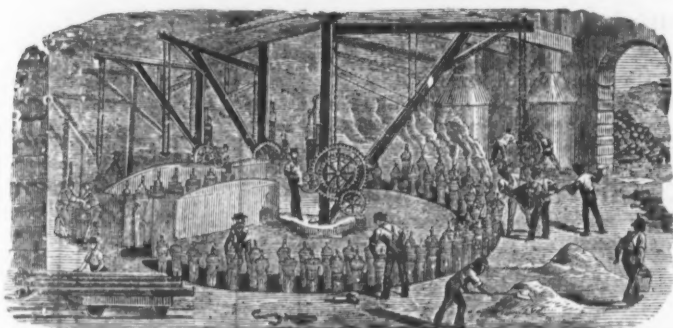
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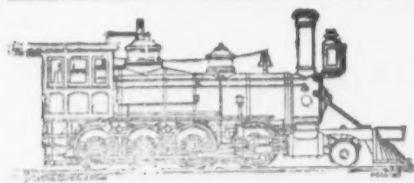
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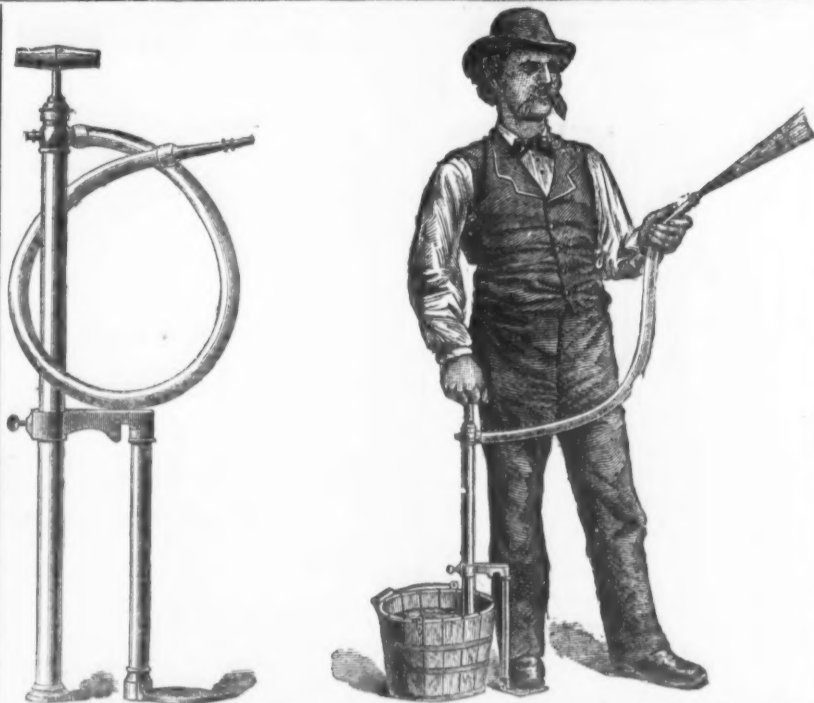
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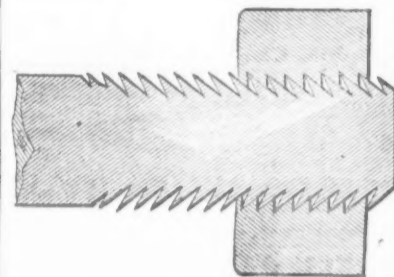
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Tack Plates and Forgings of Every Description.

**NAHUM STETSON, Jr., Agent, 73 Pearl Street, New York.****New Forms of Screw Threads.**

The Harvey Manufacturing Company, of New York City, are now introducing two new forms of screw threads that possess some advantages over other forms of thread in use. There are several peculiarities in the character of this thread, a description of which we feel sure will interest our readers. One of the new screw threads in question is shown in Fig. 1 of the engravings. The thread in the nut is what may be termed a reversed ratchet thread, and that in the bolt an undercut ratchet thread, the amount of undercut being about two degrees. Where this form of thread is used, the diameter of the bolt may vary as much as 1-32d of an inch in a bolt 3/4 inch in diameter, and yet the nut will screw home and be a tight fit. The difference in the thread fit that ordinarily arises from differences in the standards of measurement from wear of the threading



New Forms of Screw Threads.—Fig. 1.—A Substitute for Lock Nuts.

tools, does not in this form affect the fit of the nut to the bolt. In screwing the nut on, the threads conform one to the other, giving a bearing area extending over the full sides of the thread. The undercutting on the leading face of the bolt thread gives room for the metal to conform itself to the nut thread, which it does very completely. The result is that the nut may be passed up and down the bolt several times and still remain tight and fit to be worked by hand. Experiment has demonstrated that it may be run up and down the bolt dozens of times without becoming as loose as an ordinary bolt and nut. On account of this capacity of the peculiar form of thread employed to adapt itself, the threads may be made a tight fit when the threading tools are new. The extra tightness that arises from the wear of these tools is accommodated in the undercutting, which gives room for the thread to adjust itself to the opposite part.

In the second form of thread introduced by this company, the thread on the bolt is made of the usual V shape United States standard. The thread in the nut, however, is formed as illustrated in Fig. 2, which is a greatly enlarged section of a 3/4-inch bolt, for the sake of clearness of illustration. The leading threads are of the same angle as the

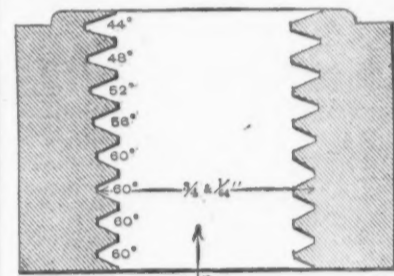


Fig. 2.—New Form of Thread for Nuts to be Used on Ordinary Bolts.

thread on the bolt, but their diameters are 1/4 and 1-16th inch, which allows the nut to pass easily upon the bolt. The angle of the next thread following is 56°, the succeeding one 52°, and so on, each thread having 4° less angle than the one preceding, while the pitch remains the same throughout. As a result, the rear threads are deeper than the leading ones. As the nut is screwed home, the bolt thread is forced out, and fills the rear threads to a degree depending upon the diameter of the bolt thread. For example, if the bolt is 3/4 inch, its leading or end thread will simply change its angle from that of 60°, to that of 44°, or if the bolt thread is 3/4 and 1-64th inch in diameter, its leading thread will change from an angle of 60°, to one of 44°. It will almost completely fill the loose thread in the nut. The areas of spaces between the nut threads are very nearly equal, although slightly greater at the back end of the nut, so that if the front end will enter at all, the nut will screw home, while the thread fit will be tight, even under a considerable variation in the bolt itself. From this description, it is evident that the employment of nuts threaded in this manner is only necessary in order to give to ordinary bolts all the advantages of tightness due to this form of thread.

**The British Iron and Steel Institute.—Vienna Meeting.**

A large representative committee, headed by Herr Von Frey, manager of the largest Austrian iron works, has been formed at Vienna for the purpose of making preparations for the autumn meeting of the British Iron and Steel Institute. There is every indication that the meeting will be one of exceptional interest and importance, the various business events, moreover, being combined with a number of entertainments, as shown by the preliminary programme which was issued some time since. The Pesth Town Council have granted 3000 florins toward the local reception fund, and the members of the iron trade, as well as the corporations in Styria, are doing their utmost to receive the members of the Institute in a suitable manner. It is said that as early as August 7, nearly 300 English members had announced their intention to be present at the meeting, and among them we would mention the following gentlemen, well known in metallurgical circles: Sir

Henry Bessemer, Dr. Siemens, Lords Granville, Dudley and Cavendish, Messrs. Bell, Gilchrist, Menelaus and Thomas and Professors Gruner, of Paris, and Akerman, of Stockholm, Sweden, in addition to which numerous members from Belgium and Germany are expected. The list of papers to be read at this meeting comprises the following: "The Styrian Iron Industry," by Peter Ritter von Tunner; "The Iron Industry of Hungary," by A. R. von Kerpely; "The Manufacture of Bessemer Steel with Lignite in the Siemens Furnace," by Director Carl Witgenstein; "An Improved Traveling Crane for Casting Steel," by Director Paul Kupelwieser; "Comparative Working Results with Charcoal and Coke Furnaces," by Mr. I. Lowthian Bell; "The Chemical Composition and Examination of Steel Rails," by Mr. G. E. Snelus; "The Production of American Anthracite," by Mr. John Hartman, of Philadelphia; "Coal Washing," by Mr. Fritz Baare, of Bochum; "The Tin Plate Trade," by Mr. E. Trubshaw; "The Prussian Institute for Testing Iron and Steel and its Work," by Dr. H. Wedding, of Berlin; "Hot Blast Apparatus, Massicks & Crooke's Patent," by Mr. Thomas Massicks, and "The Recent Progress in the Casting of Steel," by M. Fourcel, of Terrenoire.

**The Electric Light and Gaseous Fuel.**

In his address recently delivered as president of the British Association, Dr. C. W. Siemens made the following remarks on the electric light and gaseous fuel:

It can no longer be a matter of reasonable doubt that electric lighting will take its place as a public illuminant, and that even though its cost should be found greater than that of gas, it will be preferred for the lighting of drawing-rooms and dining-rooms, theaters and concert-rooms, museums, churches, warehouses, showrooms, printing establishments and factories, and also the cabins and engine-rooms of passenger steamers. When placed within a holophote, the electric lamp has already become a powerful auxiliary in effecting military operations both by sea and land. The electric light may be worked by natural sources of power such as waterfalls, the tidal wave, or the wind, and it is conceivable that these may be utilized at considerable distances by means of metallic conductors. Some five years ago I called attention to the vastness of those sources of energy, and the facility offered by electrical conduction in rendering them available for lighting and power supply, while Sir William Thompson made this important matter the subject of his admirable address to Section (A) last year at York, and dealt with it in an exhaustive manner. The advantages of the electric light and of the distribution of power by electricity have lately been recognized by the British Government, who have just passed a bill through Parliament to facilitate the establishment of electrical conductors in towns, subject to certain regulating clauses to protect the interests of the public and local authorities. Assuming the cost of electric light to be practically the same as gas, the preference for one or the other will, in each application, be decided upon grounds of relative convenience, but I venture to think that gas-lighting will hold its own as the poor man's friend. Gas is an institution of the utmost value to the artisan; it requires hardly any attention, is supplied upon regulated terms, and gives, with what should be a cheerful light, a genial warmth, which often saves the lighting of a fire. The time is, moreover, not far distant, I venture to think, when both rich and poor will largely resort to gas as the most convenient, the cleanest and the cheapest of heating agents, and when raw coal will be seen only at the colliery or at the gas works. In all cases where the town to be supplied is within, say, 30 miles of the colliery, the gas works may, with advantage, be planted at the mouth, or, still better, at the foot of the pit, whereby all haulage of fuel would be avoided, and the gas, in its ascent from the bottom of the colliery, would acquire an onward pressure sufficient, probably, to impel it to its destination. The possibility of transporting combustible gas through pipes for such a distance has been proved at Pittsburgh, where natural gas from the oil districts is used in large quantities.

The quasi monopoly so long enjoyed by gas companies has had the inevitable effect of checking progress. The gas being supplied by meter, it has been seemingly to the advantage of the companies to give merely the prescribed illuminating power, and to discourage the invention of economical burners, in order that the consumption might reach a maximum. The application of gas for heating purposes has not been encouraged, and is still made difficult in consequence of the objectionable practice of reducing the pressure in the mains during the day time to the lowest possible point consistent with prevention of atmospheric draught. The introduction of the electric light has convinced gas managers and directors that such a policy is no longer tenable, but must give way to one of technical progress; new processes for cheapening the production and increasing the purity and illuminating power of gas are being fully discussed before the Gas Institute, and improved burners, rivaling the electric light in brilliancy, greet our eyes as we pass along our principal thoroughfares. Regarding the importance of the gas supply as it exists at present, we find from a Government return that the capital invested in gas works in England, other than those of local authorities, amounts to £30,000,000; in these 4,281,048 tons of coal are converted annually, producing 43,000,000,000 cubic feet of gas, and about 2,800,000 tons of coke; whereas the total amount of coal annually converted in the United Kingdom may be estimated at 9,000,000 tons, and the by-products therefrom at 500,000 tons of tar, 1,000,000 tons of ammonia liquor, and 4,000,000 tons of coke, according to the returns kindly furnished me by the managers of many of the gas works and corporations. To these may be added, say, 120,000 tons of sulphur, which up to the present time is a waste product. The color industry utilizes even now practically all the benzene, a large proportion of the solvent naphtha, all the anthracene, and a portion of the naphthalene resulting from the distillation of coal tar; and the

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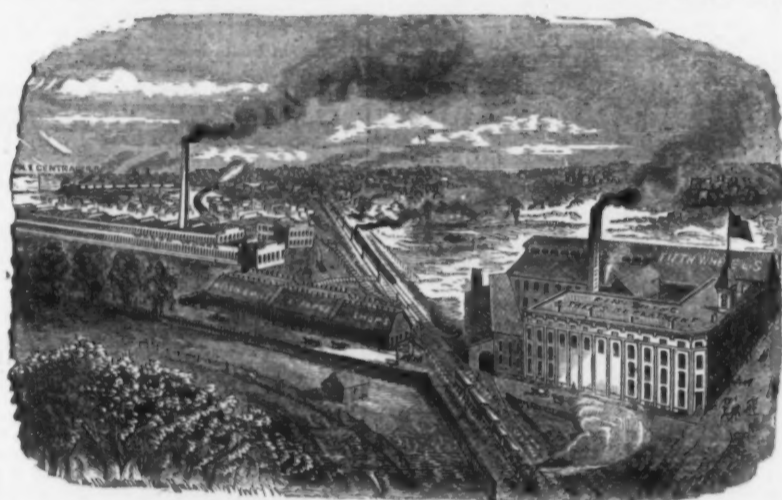


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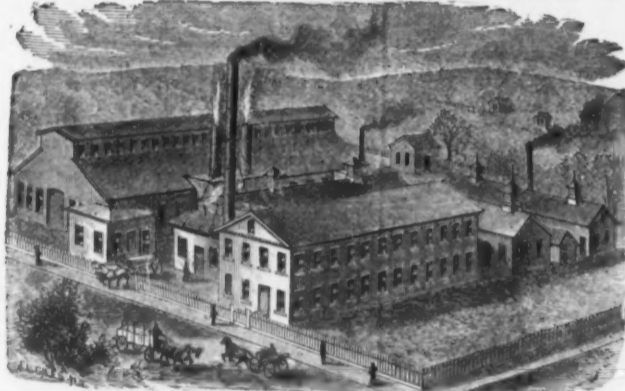
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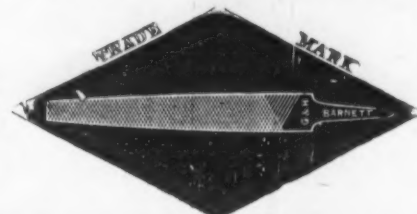
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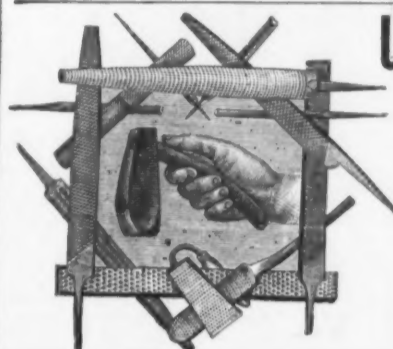
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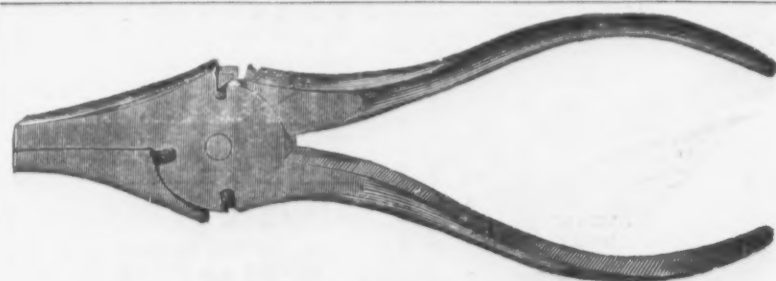
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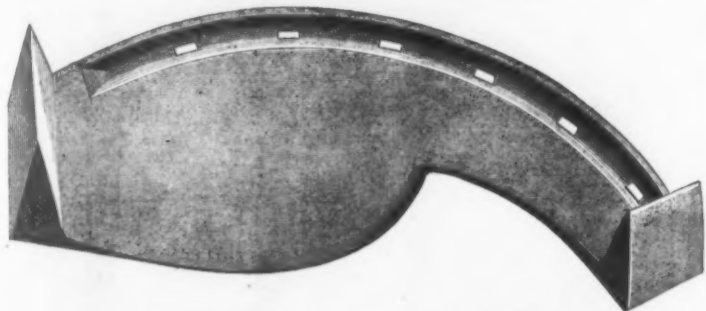
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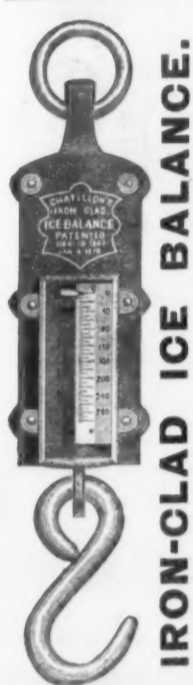
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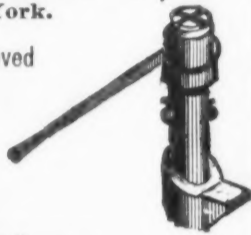
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value of the coloring matter thus produced is estimated by Mr. Perkin at £3,350,000. The demand for ammonia may be taken as unlimited, on account of its high agricultural value as a manure; and considering the falling supply of guano and the growing necessity for stimulating the fertility of our soil, an increased production of ammonia may be regarded as a matter of national importance, for the supply of which we have to look almost exclusively to our gas works. The present production of 1,000,000 tons of liquor yields 95,000 tons of sulphate of ammonia; which, taken at £20. 10/ a ton, represents an annual value of £1,947,000. The total annual value of the gas-work's by-products may be estimated as follows:

Coloring matter.....	£3,350,000
Sulphate of ammonia.....	1,947,000
Pitch (125,000 gallons).....	365,000
Creosote (5,000,000 gallons).....	208,000
Crude carbolic acid (1,000,000 gallons).....	100,000
Gas coke, 4,000,000 tons (after allowing 2,000,000 tons consumption in working the retorts) at 12/.....	2,400,000
Total.....	£8,370,000

Taking the coal used (9,000,000 tons) at 12/., equal to £5,400,000, it follows that the by-products exceed in value the coal used by very nearly £3,000,000. In using raw coal for heating purposes, these valuable products are not only absolutely lost to us, but in their stead we are favored with those semi-gaseous by-products in the atmosphere, too well known to the denizens of London and other large towns as smoke. The hurtful influence of smoke upon public health, the great personal discomfort to which it gives rise, and the vast expense it indirectly causes, through the destruction of our monuments, pictures, furniture and apparel, are now being recognized, as is evinced by the success of recent smoke-abatement exhibitions. The most effectual remedy would result from a general recognition of the fact that, wherever smoke is produced, fuel is being consumed wastefully, and that all our calorific effects, from the largest down to the domestic fire, can be realized as completely and more economically without allowing any of the fuel employed to reach the atmosphere unburned. This most desirable result may be effected by the use of gas for all heating purposes, with or without the addition of coke or anthracite.

Experiments made some years ago by Mr. Ellison, of the Paris Gas Works, have shown that the gases rich in carbon, such as olefiant and acetylene, are developed chiefly during an interval of time beginning half an hour after the commencement and terminating at half the whole period of distillation, while during the remainder of the time, marsh gas and hydrogen are chiefly developed, which, while possessing little illuminating power, are most advantageous for heating purposes. By resorting to improved means of heating the retorts with gaseous fuel, such as have been in use at the Paris Gas Works for a considerable number of years, the length of time for effecting each distillation may be shortened from six hours, the usual period in former years, to four, or even three, hours, as now practiced at Glasgow and elsewhere. By this means a given number of retorts can be made to produce, in addition to the former quantity of illuminating gas of superior quality, a similar quantity of heating gas, resulting in a diminished cost of production and an increased supply of the valuable by-products previously referred to. It has been shown that gas may be used advantageously for domestic purposes with judicious management, even under present conditions, and it is easy to conceive that its consumption for heating would soon increase, perhaps tenfold, if supplied separately at, say, 1/ a 1000 cubic feet. At this price gas would be not only the cleanest and most convenient, but also the cheapest form of fuel, and the enormous increase of consumption, the superior quality of the illuminating gas obtained by selection, and the proportionate increase of by-products, would amply compensate the gas company or corporation for the comparatively low price of the heating gas.

In the production of mechanical effect from heat, gaseous fuel also presents most striking advantages. A good expansive steam engine is capable of yielding as mechanical work two-seventh part of the heat communicated to the boiler, which does not include the heat lost by imperfect combustion and that carried away in the chimney. Adding to these the losses by friction and radiation in the engine, we find that the best steam engine yet constructed does not yield in mechanical effect more than one-seventh part of the heat energy residing in the fuel consumed. In the gas engine we have also to make reductions from the theoretical efficiency, on account of the rather serious loss of heat by absorption into the working cylinder, which has to be cooled artificially in order to keep its temperature down to a point at which lubrication is possible; this, together with frictional loss, cannot be taken at less than one-half, and reduces the factor of efficiency of the engine to one-fourth. It follows from these considerations that the gas or calorific engine combines the conditions most favorable to the attainment of maximum results, and it may reasonably be supposed that the difficulties still in the way of their application on a large scale will gradually be removed. Before many years have elapsed we shall find in our factories and on board our ships engines with a fuel consumption not exceeding 1 pound of coal per effective horse-power per hour, in which the gas producer takes the place of the somewhat complex and dangerous steam boiler. The advent of such an engine and of the dynamo machine must mark a new era of material progress at least equal to that produced by the introduction of steam-power in the early part of our century.

The Austrian Alpine Metallurgical Company have recently received three large orders for rails. The first, for the Franz-Josef Railway, is for 6000 tons, to be delivered in 1882 and 1883; the second, for the Hungarian State Railways, is for 2000 tons, being the first instalment of a larger order; and the third is for the Northwestern Railway of Austria, to the extent of 6700 tons of rails, and 1200 tons of iron, intended for various purposes, the whole lot to be delivered next spring.

**Machine Riveting In British Shipyards.**

The question of machine riveting as a substitute for that of manual work, has of late attracted considerable attention in the shipbuilding yards of the North of England, the question having been prominently brought forward by the irregular habits of some of the riveters, who lose a considerable amount of working time, owing to their own fault or that of their comrades. Machine riveters have already been in use in several of the yards for some time, and in one case all the beams and frames of ships have been riveted for several years with a fixed machine. In others, general work has been done with movable machines. The general belief is that these machines effect their purpose thoroughly, and that the actual cost of riveting with them is much less than that of the manual labor that they supplant, but the interest on the cost of the plant, and the cost of the removal of machines, or of the work to be riveted, minimizes the saving that would otherwise be effected. The delay caused by the irregularity of the work of sections of the workmen is turning the thoughts of the shipbuilders and of their managers to the possibility of the greater use of machinery, and it is probable that at some of the chief yards there will be a considerable addition to the riveting plant. Those yards which adopt the plan will be able to use their machines to a greater extent at no distant time, for there will be gradually an adaptation to the work, and there will be, as the value of the machine riveter is proved, a greater dependence upon it, while after the first cost the saving on the price of riveting will be greater. The question is one that is not so likely to be taken up in dull times, but with the pressure that many of the shipyards now feel, it seems probable that there will be an attempt to increase the dependence upon machinery, which is not subject to the influences that have restricted the labor of men very seriously at times.

**Handling a Shell.**

The daily papers have reported a humorous incident which is said to have happened in Alexandria during the recent bombardment. A shell belonging to the ship Inflexible had passed into a house without exploding, and the gentleman residing in it requested its removal. A number of men were accordingly sent on shore, and after some consideration as to the best plan to be pursued in removing the dangerous visitor, a feather bed was procured and the shell firmly enveloped in it. It was then carefully rolled down stairs, and was probably thrown into the sea. The London Engineer, in dwelling upon this incident, says that in preference to this treatment it would have been well to make a sort of little ring wall with clay or putty around some spot on the upper side of the shell, such as would enable the persons handling it to have a small quantity of water on it. By drilling a hole into the interior of the shell, moving the bit very gently and keeping the water on it constantly, the charge might have been gradually saturated and all danger have been effectually avoided. The fact that the shell was thrown into the sea is no convincing evidence that its dangerous properties were destroyed, conclusively shown by the fact that an iron shell which had lain under water 200 years, and which was brought to the surface, was so finely honeycombed by the sea water and presented metal in so fine a state of division that, to the horror of the surprised finder the shell gradually steamed fiercely and became red hot. It is not at all improbable that a similar occurrence may take place in connection with the shell here considered; and if, in subsequent years, the shell should be found and brought to the surface, it is not beyond possibility that the finders will be surprised in a similar manner.

**Very Light Cars.**

Mr. F. D. Adams, of the Boston and Albany Railroad, recently turned out a pair of parlor cars for the fast Boston and New York express which are rather remarkable, to say the least, from a car-builder's standpoint. They have 42-inch paper wheels, the journals are 3 1/4 by 7, and the trucks weigh 18,000 pounds; the body weighs 27,000 pounds, making a total of 45,000 for the whole car. We think this is the lightest coach of the kind that has yet been turned out. It is now some 10 or 12 years since Mr. Adams first directed attention toward the lightening up of his car bodies. By the careful selection of wood, and the reduction of useless weight at every possible point, he has gradually reduced the weight of his cars without in any way lessening the strength. At the present time, we believe, he uses an arch in the side of the car, framed into the posts in the place of a truss plank. By this means a very considerable amount of dead weight is saved, and it is claimed that the strength is fully equal to that of the old-fashioned plank. In the matter of furring up between the posts and in the roof, the greatest care is taken to have every piece precisely the right size and shape, and never any larger than is necessary. This is a trifling item, but it is a key to the whole question of light cars. No piece is allowed to go into the car which is any way larger or heavier than is absolutely necessary. Before the change of gauge on the Erie road there were some passenger coaches built which were probably the nearest to these in their dead weight. The figures, however, we have not at hand at the present moment. If we recollect rightly, some of the broad gauge eight-wheel, 72-passenger coaches, with one saloon, weighed about 34,000 to 35,000 pounds. They, however, had only 33-inch wheels.

One of our exchanges announces a new candidate for favor in the shape of an imitation of ivory which is not, like celluloid, highly combustible. Formula is given at great length, and it appears to be an effort to imitate chemically the composition of ivory, not, however, by simply putting the different ingredients together, but by causing them, as far as possible, to combine with each other by means of chemical reaction. The principal ingredients are casein in ammonia, and albumen in water, to which

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Works, Camden, N. J. 6 John St., New York**GRAY IRON CASTINGS.****JOHN KEPPELMAN, Reading, Pa.,**  
Herewith gives notice that he has opened a Jobbing Foundry, and is ready to receive orders for all kinds of Light Gray Iron Castings; also, for every description of Machinery. Orders promptly filled. Please address  
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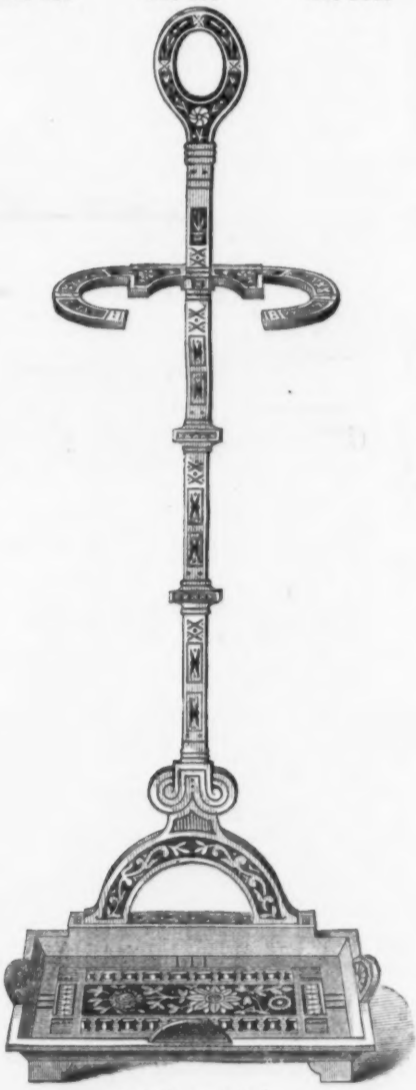
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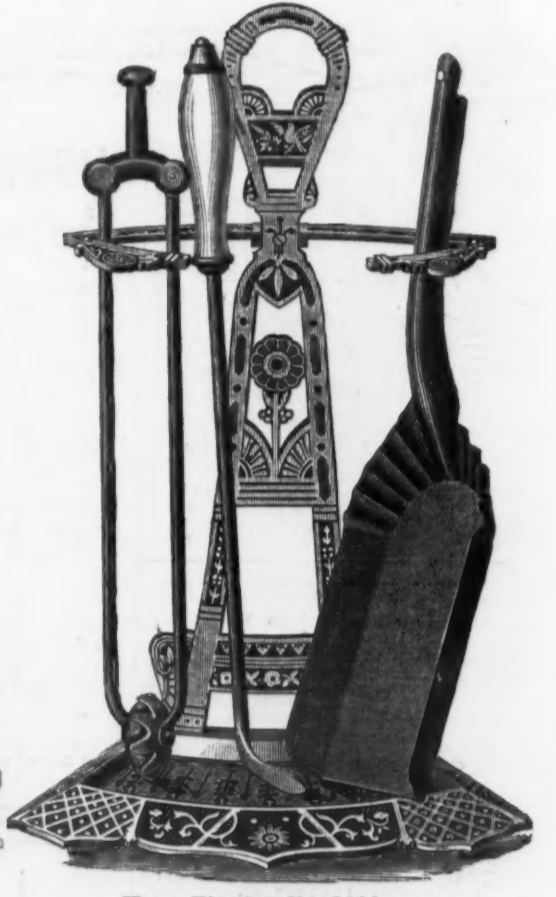
Stand No. 8022.



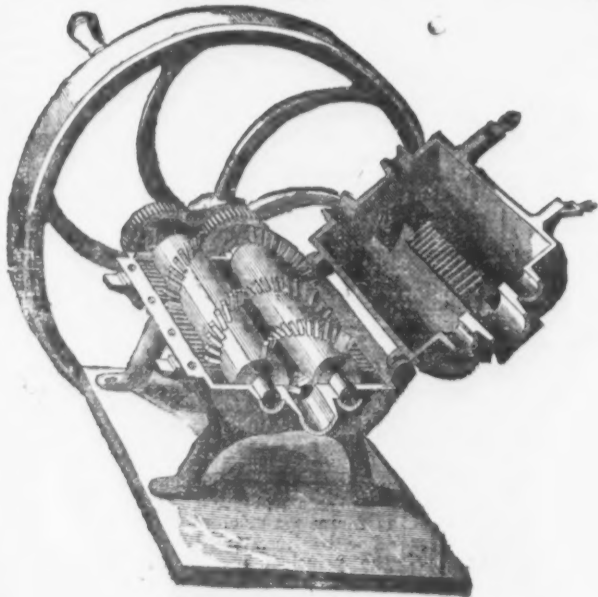
Stand No. 8023.



Home Fire Sets No. 8002.



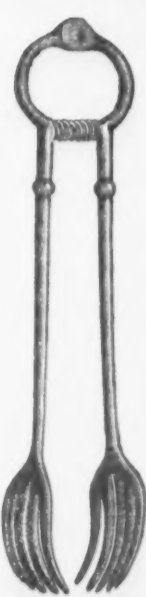
Home Fire Sets No. 8000.



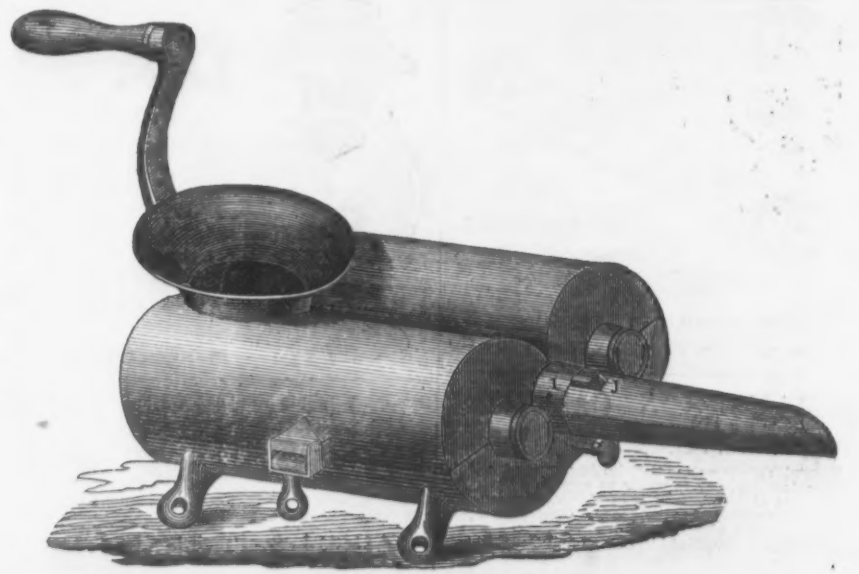
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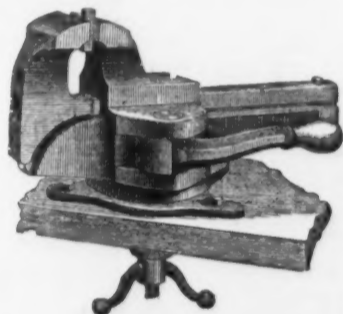
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are added quicklime, acetate of alumina and a large quantity of sulphate of lime. In some cases a little tannin is substituted for the acetate of alumina, and lastly a little oil is added. When the substance has been thoroughly pressed it is dipped in glue water containing a small proportion of phosphoric acid. It is evident that the inventor of the substance had a clear idea of what he wished to do and was working in what may probably be the right direction. Whether he has obtained the long-wished-for artificial ivory yet remains to be seen. If he has, a fortune undoubtedly awaits the manufacturer.

### The Copper Mines of Lake Superior.

The existence of the remarkable copper deposits of the northern peninsula of Michigan were evidently known to a prehistoric race of men who, it is thought, came from a distance in boats, making annual visits. The assumption that this is the case is based upon the fact that implements are found now and then which mark the race who used them to have been different from the aboriginal inhabitants of the country as found by the first white settlers. It is a singular fact that about all the prominent mines in the region worked in late years show that they had been previously opened by these ancient copper workers, and the amount of labor expended in some places exhibits a comprehensiveness and patient industry not to be expected from the North American Indians. The hard and solid rock has in some places been penetrated to a depth of from 30 to 60 feet, and long drifts have been found in the veins, which must have required an immense amount of labor and perseverance on the part of the ancient toilers, lacking as they did the explosives and improved implements of the present day. More than 200 years ago the French Catholic fathers penetrated this region, established their missions, and gave the first indications of copper deposits in mines. An attempt at mining which was made in 1770 by an English company resulted in a complete failure. In 1796 Michigan was acquired by the United States Government, and in 1813-1819 a survey of the region was conducted by the General Government, under the territorial Governor, General Louis Case, who personally attended the first surveys of the copper peninsula. These preliminary surveys were made about the Ontonagon River, and the party visited and reported upon a mass of copper weighing several tons, and lying upon the bank of the river some 20 miles from its mouth. This mass of metal was found surrounded by rude and broken tools, and bore the marks of much hammering and cutting. Closer inspection showed that it had been removed from its original bed, and gave evidence by the adhering matrix of a neighboring copper vein. This large mass of copper, up to the time of its removal in 1842 to Washington, was the largest piece of native copper ever found, and stimulated a belief in many that other and larger masses would yet be discovered in that region.

Some years later leases or mining permits were issued by the War Department. These leases required a payment to the government of six per cent. on all the copper mined for a fixed period of years, and in a comparatively short time a large number of locations were made. The first actual mining prosecuted was in the year 1844, by an association of Boston and Pittsburgh men, who found a deposit of black oxide of copper, this being the only one of that character ever found in the region. In 1845 the Cliff Mine was discovered at Eagle River, which, upon being opened, yielded, beyond all expectation, an unprecedented amount of copper in masses, and demonstrated for the first time the actual existence of mass copper in that place. The richness of this amygdaloid trap rock, comprising the matrix of the copper in the cliff, was further proved by the workings of the Minnesota Mine at the Ontonagon River in 1847. This mine produced for a number of years large quantities of mass copper, and occasioned much excitement in copper mining, as will probably be remembered by a few. The largest mass of native copper ever discovered in the annals of copper mining was found in the Minnesota Mine in 1857, and its weight was estimated at 500 tons. The block was 46 feet long, 18½ feet wide at its greatest breadth, and its average thickness was 8½ feet. This mass required the labor of 20 men for three months to cut it up into suitable blocks for transportation and smelting. It is said that over 100 kegs of powder were expended in starting the mass from its original setting in the mine.

The success of the Cliff and Minnesota mines induced the organization of many companies for the working of the amygdaloid trap and epidote formations for mass copper, but, with the exception of the Central Mine, no instances of notable success were met with. This mine presented the feature of having been the first and only mine ever opened in the Lake Superior region which paid its working expenses in the first year of work from the product of the mine. In proportion to the original sum contributed to open the mine, the Minnesota has paid more than any other Lake Superior Mine, not excepting the Calumet and Hecla. This mine surpasses any in the world in its peculiar richness and also in several other respects. The mine descends from the surface at an angle of about 38 degrees, and is remarkably well ventilated. The mills of the company are situated at Torch Lake, about five miles from the mine, and are large and conveniently arranged. A careful examination of the bottom level of the mine shows that no exhaustion is taking place, and the rock broken at the bottom is said to be equal to any from the upper levels, showing that no deterioration in quality has taken place as mining operations have been extended downward. It must, in fact, be conceded that the Calumet and Hecla Company bids fair in the future to pay as much in dividends as it has in the past.

The Schoolcraft Mining Company was organized for the purpose of working the conglomerate belt north of the Calumet and Hecla, but its whole capital was expended in unsuccessful efforts. Operations were, however, again commenced under a new organization in working the same belt upon which

the Osceola Company is now engaged. A noted improvement is observed, commencing upon the 22d level north in the Calumet and Hecla Mine, about 2000 feet from the northern limit of that property, which is visibly extending itself toward the Schoolcraft property. On the 25th level below the pay rock is found extending more northerly, and it is not improbable that this deposit may extend so far north as to be found in the Schoolcraft conglomerate now known as the Centennial, and at a depth of 2000 feet from the surface. How deep the workings of the Calumet and Hecla Mine may extend, and how deep the pay rock goes, are purely matters of conjecture, but it is evident that the ore extends to a great depth, and that the workings may yet be carried deeper than those of any other mine in the world. The vertical depth of the mine is not 2000 feet, the length of the air line, however, being 2600 feet. Several years since it was thought that the present depth of the mine might be the limit for successful working, but there is no doubt that the mine can be worked successfully at a much greater depth than at present, although the exact limit cannot be given with any degree of accuracy. The mine has been the occasion of the building up of two considerable towns, one at Calumet, where the mines are situated, and one at Torch Lake, where the mills are, and both places are furnished with large and commodious schoolhouses, churches and stores. The company has added to its machinery department at Calumet one of the largest compound stationary engines in the world, but owing to several difficulties which have been encountered it is probable that some time will elapse before the engine will complete its purpose of running the whole mining outfit, hoisting gear, pumps and various other appliances. In any case the old gear will be retained for use in any emergency.

West of the Calumet and Hecla property the Tamarack Company has taken its position, expecting to strike the Calumet conglomerate at a depth of about 2200 feet from the surface by a vertical shaft at a point which the Calumet and Hecla would reach at a depth of 3500 feet on the present plane. It must be borne in mind, however, that although this company may strike and intercept and work a conglomerate at this point, the Calumet and Hecla, though it may lose its hold upon the principal part of the vein as intercepted by the Tamarack, has still a large territory both north and south of this point which may continue to pay largely, and that the probable future of the Calumet and Hecla is by no means threatened by the success of the Tamarack. The latter comes in cornerwise, with its shaft in the corner of a 40-acre section, but has behind it a territory increasing both northerly and southerly upon the westerly extension of the conglomerate. There is some probability that the Tamarack may strike amygdaloid deposits in its course.

The introduction of high explosives has produced a considerable change in the Lake Superior region within the past few years, and the application of steam drills underground have reduced the mining expenses by an appreciable quantity. This has enabled some companies to continue operations and pay profits which, a few years ago, even with a higher price for copper, could not possibly have existed. This is notably evinced in the instance of the Atlantic Mining Company, three miles west of Houghton. This company, when first started, expended a large amount of capital without any profitable results, but under a new organization it has demonstrated the successful working of the lowest grade rock worked in that region. This has been accomplished by the most careful and economical management, and by the application of high explosives, steam drills, and automatic handling of the ore. In the year 1881 the company realized a profit of \$82,000, working its ore from a depth of 1500 feet below the surface, and transporting it a distance of about three miles by railroad to Portage Lake. The results obtained by this company have thus far been very encouraging. The economy and skill characterizing the management of this mine may also be claimed for the Osceola Mine, which may be considered of the most modern type and completeness of any at the Lake, although the company suffers under the disadvantage of having to transport its rock some 11 miles in distance and over a railroad not its own, thus paying a somewhat higher rate for transportation than the one above mentioned. It is therefore not at all improbable that the company may at some later time build a railroad of its own, or combine with the mineral range railroad, which now transports the ore. The success of the Atlantic Mining Company and its skillful handling of the low grade ore raised the question if the Huron Mine could not, under equally good management, demonstrate a considerable success. A large amount of money has been expended on this property, which lies not very far west of the Atlantic mine, and consists of about 1000 acres. It is undoubtedly crossed by a number of copper veins, the principal one known being the Isle Royal. In this vein copper is found more in deposits and not continuously, as in the Calumet and Hecla and in the Atlantic Mine. The greater part of the expenditure made was upon surface improvements rather than in the development of the mines. The erection of a modern and suitable mine cannot fail to exert a beneficial influence on the operations of the company. The explorations of the mine could be largely aided by the use of diamond drills, and there may be extensive copper deposits which have not yet been discovered within the limits of the property. The expenses of working the Pewabic and Franklin mines have been reduced considerably within the past few years, while their productiveness has been increased. The two mines adjoin each other and are upon the same belt as the Quincy Mine. The average yield from the Franklin is 1¼ per cent. in copper, and of the Pewabic 2 per cent. Both companies are provided with well-equipped mills. The Franklin runs about 500 tons per day and the Pewabic 200 tons, and the total mine and milling expense of the Franklin rock is estimated at \$2.17 per ton.

Next to the Calumet and Hecla Company

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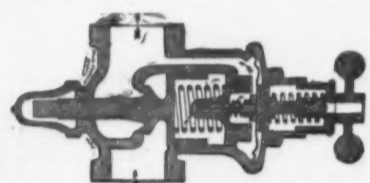
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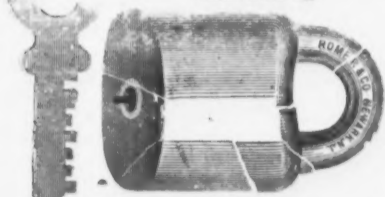
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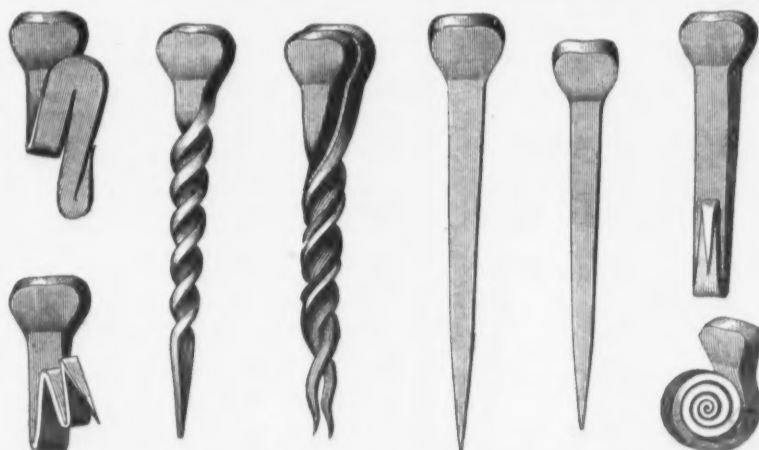
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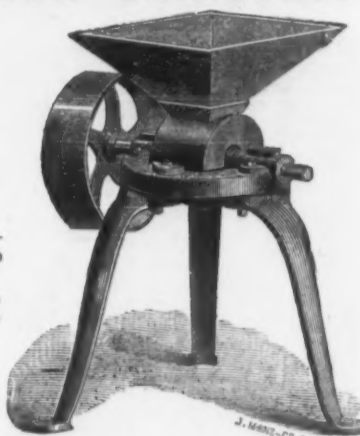
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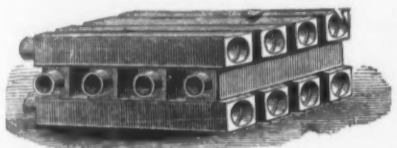
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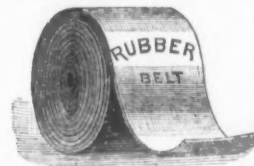
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### SCIENTIFIC AND TECHNICAL.

#### Transmission of Gases through Fluids of Different Densities.

Mr. C. Gilbert Wheeler states, in the *American Chemical Journal*, that if in a given acidified and nearly saturated solution of a salt (for example, ferrous sulphate and a small quantity of sulphuric acid) a piece of zinc is placed, and this solution carefully overlaid with common water, the bubbles of hydrogen appear to meet with considerable resistance at the zone of contact between the two liquids, and from one-third to one-half are reflected downward and to one side. Finally, however, they are again induced by their relative levity to rise, and now scattered, and at a part of the vessel remote from their first ascent, pass through the upper zone and escape into the air. This phenomenon is again exhibited if upon the second or upper stratum a third liquid is superimposed having a density less than that of water. The appearances at this second zone are, however, not quite as marked as at the first. Mr. Wheeler cannot satisfactorily account for this apparent reflection of hydrogen bubbles in passing from a denser into a rarer medium. Certainly it does not appear reasonable that the circumstance of their meeting with less resistance on entering the rarer medium should occasion a reflection, though by virtue of the reduced difference between the densities of the aeriform body in this second stratum and its enveloping fluid it is conceivable why, perhaps, a less rapid upward movement should result. This influence in favor of a less rapid movement would appear, however, to be more than compensated for by the diminished resistance of the second medium. In explanation of the above phenomenon, it may also be assumed that the bubbles of gas as they rise from the saline liquid into the water above carry with them their envelope, i. e., the thin film of solution encircling them. When, therefore, they enter the upper liquid they are too much weighted down to pass as once through the latter, and are, therefore, detained for an instant. In the meanwhile they are caught by the descending current of the solution, and are for a time carried sideward and downward. This downward current is caused as a result of the upward current formed by the rapid ascent of the hydrogen set free by the zinc. Mr. Wheeler is now devising experiments in order to settle this, if possible, and hopes soon to submit further particulars.

#### Detection of Fire Damp in Mines.

Dr. I. Kitsee, of Cincinnati, Ohio, has just patented an invention which promises to relieve mining operations to some extent of their most dangerous features, namely, explosions of fire damp. The object of the device is to ascertain the presence of fire damp in mines before they are entered, and the invention seems capable of doing this in a prompt manner. As the gas first accumulates at the top of the galleries no one is aware of its presence until the quantity is sufficient to be detected in the lower levels. The object of the invention here considered is to obtain an earlier and more timely warning of danger. For this purpose a series of hollow balls of wire gauze, like that used in the Davy lamp, is placed along the roof of the mine through all its galleries, the balls being at a certain distance from each other. They are joined by a wire through which a constant current of electricity is sent, and the connection is made by two pieces of fusible metal melting at a comparatively low temperature. The ball is set in a non-conducting socket, and a weight or spring is so arranged that when the fusible metal melts it releases the ball, which revolves in its socket. Its surface is, moreover, provided with teeth, which in turning strike the end of the wire, making and breaking the circuit. The teeth on each ball are different, and each will thus be made by the electric current to ring its own number on the electric bell above ground like a regular fire alarm. In each of these gauze balls is placed a small platinum sponge, and all are connected by a wire in the circuit of a second current carefully isolated from the first. Before the workmen enter the mine the electric current is sent through the second wire, bringing all the platinum sponges to a white heat, which, however, is not sufficient to affect the fusible metal. If, however, fire-damp has accumulated in any one of the galleries of the mine, the incandescent platinum will cause an explosion in the inside of the gauze ball. The temperature will consequently be raised, the metal melted and the alarm will be sounded as explained above. All that is then necessary is to work the pump connecting with the gallery where the explosion occurred and thus exhaust the explosive mixture. When the turning on of the current causes no

alarm to sound, the men may enter in perfect safety, and the test may be repeated during the day at short intervals. Experiments which have been made with the apparatus are said to have given good results.

### The World's Production of Iron.

The aggregate production of iron in the different countries of the world furnishes some figures worthy of note. The British and American yield is known, while Germany produced in 1881, whether inclusive or exclusive of the production of Luxembourg is not stated, 2,907,000 metric tons, or about 2,863,400 tons of 2240 pounds, the metric ton being only 2204 pounds. Luxembourg produced 293,616 metric tons, and this quantity is given separately in the subjoined statement. France produced 1,894,861 metric tons; Belgium, 631,764; Russia, 234,864; Austro-Hungary produced 455,518 metric tons in 1880, and Sweden, 405,713. A few other countries will produce small quantities; thus Italy is said to have produced 76,000 tons in 1877, and Spain, 73,000 in 1873; the yield in Turkey is estimated at 40,000 tons, that of Australia and Japan at 10,000 each, that of Canada, Switzerland and Mexico at 7500 each, that of Norway at 3975 tons, and other countries are supposed to have produced in all about 10,000 tons.

Assuming that the yield from the minor countries was the same in 1881 as it was reported to be at the latest dates, the whole yield may be thus stated:

Year.	Gross tons
Great Britain..... 1881	8,377,364
United States..... 1881	4,144,254
Germany..... 1881	2,863,400
France..... 1881	1,894,861
Belgium..... 1881	631,764
Austro-Hungary..... 1880	455,518
Sweden..... 1880	405,713
Luxembourg..... 1881	293,616
Russia..... 1881	234,864
Italy..... 1877	76,000
Spain..... 1873	73,000
Turkey..... 1877	40,000
Japan..... 1877	10,000
All other countries.....	46,000
Total.....	19,427,510

In effect, Great Britain produced nearly 43 per cent. of all the iron made in the world; the United States, 21.3 per cent.; Germany, 14.9 per cent.; France, 9.2 per cent., and all other countries, 11.6 per cent. The four countries which produced 88.4 per cent. of the world's supply of iron are the foremost in power, in wealth, in literature and in science, and the two English-speaking nations produce nearly two-thirds of the whole. The United States consumed 29 per cent. and Great Britain 23.4 per cent. of the whole. The total amount consumed by two nations alone thus being 52.4 per cent.

**The Thomas-Gilchrist Process at Creusot.**—We learn from Mr. S. G. Thomas that M. Delafond, the inspector of rails for the French Government, has recently reported for the State railways on the basic process at Creusot. In his report, which appeared in a late number of the *Annales des Mines*, he says: "Summing up we can say that the problem of the manufacture of steel from phosphoric pig is resolved, both for the Bessemer and open-hearth processes, by the employment of a peculiar lining of magnesian lime. The removal of phosphorus is as satisfactory as possible, that of silicon is almost complete and a great part of the sulphur is also removed. The series of analyses quoted show that the basic steel is purer than the acid steel, and is more uniform in composition. The mechanical tests of tensile strength show that the basic steel is appreciably more regular than the acid. The rails manufactured with the two kinds of steel give equally good results. The State has therefore decided to accept indifferently rail tenders for acid and basic steel. In the Siemens furnace the Thomas-Gilchrist process is more easily carried out than even in the converter, and the dephosphorization is more complete."

**Powell's Improved Fence.**—The Powell Mfg. Co., of Burlington, Vt., are introducing an improvement in fences for farms, railroads, and all inclosures requiring a light, easily constructed and inexpensive fence. The principal novelty in this invention is the post and the fastenings. The former is made of rolled T-iron or steel, with flanges riveted to the lower end in order to give it a firm bearing in the soil. The flanges are triangular and form a pointed shoe, which may be readily driven into the ground. The post may be made of a single bar of T-iron, or two flat bars arranged at right angles to each other and clamped together by means of clamps used in securing the wire to the posts, and the latter, while very light, possess ample strength to resist any strain to which they are likely to be subjected. The barbed wire, or bands, or board strips, used in forming the panels are all secured in place either on the flat or ribbed side of the post by means of suitable clamps, which are provided with recesses for receiving the wire, so that it cannot be lifted out of place. Any kind of barb or plain wire may be used in connection with the post, and, if desired, wooden rails may be employed. The corner posts of the fence are supported by an internal brace, and the lower posts in long stretches of fence are furnished with an extra stay to keep them from being drawn out of the ground. The fence is readily put up, is said to be very cheap and durable, and is capable of being adapted to lawns, gardens, and inclosures of every kind.

The Brazilian Government has, it is stated, recently ordered for immediate delivery 20 Nordenfeldt (English Admiralty pattern) machine guns, 10 five-barrel rapid-fire machine guns, and 5 six-pounder rapid-fire shell guns of 1 1/2-inch caliber. The Japanese Government and the Spanish Government have each also ordered to Nordenfeldt (English Admiralty pattern) machine guns. Ammunition has in each case to be supplied, the orders exceeding together a quarter of a million rounds.

In a recent trial in Sweden, iron ores holding from 1 1/2 to 1 3/4 per cent. of sulphur were treated so successfully in a kiln built upon the Siemens regenerative plan, that the resultant pig held only from 1 to 2-100ths of 1 per cent.

## BUCK BROTHERS, Millbury, Mass.

The most complete assortment in the U. S. of

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CAUTION.—Buyers should be on their guard and not have inferior goods palmed on them by unprincipled persons, who represent them as our make. Our tools are stamped "BUCK BROTHERS," and our labels have on our trade-mark, also "Riverlin Works."

# The Iron Age

AND

## Metallurgical Review.

New York, Thursday, October 5, 1882.

DAVID WILLIAMS, Publisher and Proprietor.  
JAMES C. BAYLES, Editor.  
JOHN S. KING, Business Manager.

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### The Labor Situation West.

During the past week the Wheeling manufacturers have signed the scale and resumed work. This, we believe, brings every mill that was closed by the strike into operation. As we stated in our last issue, the unsettled questions at Wheeling related to the price of boiling, nail-plate rolling, repairs of nail machines, lengths and weights of nails, and nail-plate heating. These were virtually new demands, differing from what was paid last year with the exception of boiling, for which the men demanded the same as was paid last year. Several of the mills in the district outside of Wheeling and vicinity refused to co-operate with the Wheeling mills in their supplemental demands and resumed work. Several conferences were held between the Wheeling manufacturers and their men. The manufacturers found the men leaving them and going to other places to procure work. An agent from a Chicago mill had secured the services of a large number of nailers and feeders to go to Chicago and begin work there. To retain these men certain conferences were held, and at the first conference the manufacturers offered last year's prices, provided Pittsburgh rates should prevail after June 1st, 1883. The men refused this and the conference adjourned. After the adjournment the Laughlin Nail Company signed last year's scale, and the other mills followed suit the next day. In the settlement there was no advance on nail-plate rolling, and the question of repairs on nail machines and the lengths and weights of nails, which were two of the points at issue, remained just as they were last year. Boiling is to be paid the same as last year, but nail-plate heating is 5 cents a ton more.

Thus ends the great iron strike of 1882—a strike that was unwisely entered upon in the face of a falling market and without any prospect of success. This, added to a depleted treasury on the part of the men and the impossibility of securing funds to carry on a strike of this magnitude, soon led to a division in their ranks, and the result was inevitable under the circumstances. As a result of this there is no doubt that the Amalgamated Association will be very much weakened in numbers. Men who have paid dues to the association for years, in view of possible strikes and support during those strikes, found themselves without support; \$6 seems to have been the outside amount that was generally received. These men are loud in their protestations that they will no longer pay dues to the association. At the same time, we do not believe that the association will cease to exist, or that in real strength it will be very much weakened. We believe that while its numbers may be reduced, it will be more united, more conservative and better organized by reason of this defeat. If it is so, the gain that will come to the manufacturers as well as to the men because of this strike cannot be measured.

### American, English and French Trade with South America.

The trade with South America has been pushed with such vigor during the past ten years, both from the United States and Europe, that an analysis of what has been accomplished in the direction of its profitable development may prove of interest. We have, therefore, gathered the figures embracing the 21 years ending with 1879, separating the first 11 from the last 10 years, and reducing everything to millions of dollars:

Countries.	U. States.		England.		France.	
	Import.	Export.	Import.	Export.	Import.	Export.
Brazil:						
1859-69.....	103.95	60.10	284.02	260.04	165.41	198.25
1870-79.....	381.59	72.23	317.67	389.67	140.77	155.01
Total.....	575.54	132.33	601.69	649.71	316.18	353.26
Argentine Republic:						
1859-69.....	49.82	17.02	65.06	98.83	116.00	116.02
1870-79.....	46.10	19.69	77.70	131.43	208.29	155.75
Total.....	95.92	36.71	142.76	230.26	324.29	271.77
Uruguay:						
1859-69.....	10.80	7.30	55.86	49.20	68.58	64.18
1870-79.....	24.83	22.76	49.43	58.59	70.80	55.98
Total.....	35.63	20.06	105.29	107.79	139.38	120.16
Colombia:						
1859-69.....	31.08	34.10	54.16	95.64	7.47	24.24
1870-79.....	64.23	46.29	43.88	59.51	22.08	47.31
Total.....	95.31	80.39	98.04	155.15	29.55	71.55
Venezuela:						
1859-69.....	26.50	14.06	4.36	10.57	22.80	11.35
1870-79.....	30.11	17.52	5.43	24.40	27.99	13.67
Total.....	56.61	31.58	9.79	34.97	50.79	25.02
Chili:						
1859-69.....	18.59	21.82	107.64	92.26	23.51	70.84
1870-79.....	7.50	20.06	193.00	11.20	37.90	65.12
Total.....	26.09	41.88	300.64	103.46	61.41	135.96
Peru:						
1859-69.....	7.46	11.82	156.09	65.64	57.32	72.13
1870-79.....	19.00	26.85	29.30	92.82	91.20	60.92
Total.....	26.46	38.67	185.39	158.46	148.52	133.05

Our import from Brazil has about doubled during the last ten years, while our export to that country has increased about 20 per cent. England's export exceeded its import from there by some \$15,000,000, while that of France did so by about \$40,000,000, during the 21 years.

There has been a moderate increase in our Argentine trade, but the import has been about three times the export, while the ex-

port of England was some 50 per cent. greater than the import. The import of France was considerably greater than the export. Our import from Hungary has been greatly in excess of the export, while England shipped a little more than it received, and France received a good deal more than it shipped. Our trade with Colombia has made satisfactory headway, while England's has fallen off, but the export has been about double the import, while France shipped to Colombia more than twice the amount imported. With Venezuela we have done a rapidly increasing trade, but our export thither has risen but not mally, while England shipped nearly five times as much as she has received. France, on the other hand, has received nearly double the amount shipped. Our Chilean import has been on the decline, but our export has remained steady and satisfactory. England shipped a great deal to Chili, but received still more. France exported thither more than double the amount of import. With Peru we did a moderate, but steadily increasing, trade till the war broke out. England and France, it will be seen, did a large business with Peru, and the war has been felt by them very much. A recapitulation gives the following totals:

UNITED STATES.			
From	Import.	Export.	Total Trade.
Brazil.....	\$575.54	\$132.33	\$707.87
Argentine Republic.....	105.92	37.54	143.46
Uruguay.....	35.63	20.06	55.71
Colombia.....	95.31	80.39	175.70
Venezuela.....	56.61	31.58	88.19
Chili.....	26.09	41.88	67.97
Peru.....	26.46	38.67	65.13
Total.....	\$941.53	\$376.45	\$1,317.98
ENGLAND.			
Brazil.....	\$601.69	\$649.71	\$1,251.40
Argentine Republic.....	142.76	230.26	373.02
Uruguay.....	105.29	107.79	213.08
Colombia.....	98.04	155.15	253.19
Venezuela.....	9.79	34.97	44.76
Chili.....	300.64	103.46	404.10
Peru.....	185.39	158.46	343.85
Total.....	\$1,704.61	\$1,545.19	\$3,249.80
FRANCE.			
Brazil.....	\$316.18	\$353.26	\$669.44
Argentine Republic.....	324.29	271.77	596.06
Uruguay.....	139.38	120.16	259.54
Colombia.....	29.55	71.55	101.10
Venezuela.....	50.79	25.02	75.81
Chili.....	61.41	135.96	197.37
Peru.....	148.52	133.05	281.57
Total.....	\$1,066.95	\$713.71	\$1,780.66

This recapitulation shows that our export has constituted only a little over a quarter of the entire trade we did with the leading South American countries, while England's import during 21 years has been some \$160,000,000 in excess of the export. France during this period, on the other hand, shipped some \$45,000,000 more than she received.

### Guaranteed Tin Plates.

The hesitation manifested by dealers in venturing the experiment of an inspection and classification of tin plates, is in great degree due to the fact that they are afraid the consumer would not be willing to pay what a quality guarantee would be worth. For some grades of tin plate he would not. The consumer who makes quality a consideration secondary to cheapness, and who is willing to use anything to make a profit, not only would not pay for a guarantee, but would not care to have the plates he buys classified. He does not want to know that they are as bad as they really are, and if called to account for using inferior stock, it would be better for him to plead that he bought plates under the assurance that they were of good quality, and conceal the fact that he knew they were not good. For this class of trade we ask no benefits. Those for whom they do work, or who buy the goods they make, are the only ones entitled to sympathy.

But there is a very large and constant demand for good plates and for protection against the unnumbered contingencies of purchasing under the brand system. A majority of the consumers of the country are dissatisfied with what they consider the steady deterioration of tin plates, and are disgusted with their experiences in buying plates by name. The dealer, when his attention is called to this, replies: "The fault is with the consumer. For years he has been 'crowding prices down and demanding 'something cheaper. We have had to meet 'his demand, and as a natural and inevitable consequence, quality has suffered. If 'he wants good plates to-day he can get 'them, provided he is willing to pay for 'them."

In this there is a good deal of truth, but it only tells half the story. The demand of the consumer for cheaper plates has been fostered by the dealer, who has assured him that this or that unknown plate at \$5 was "equal" to this or that standard plate at \$6, \$7 or \$8, as the case may be. Four-fifths of the tricks of the tin-plate trade have been resorted to with a view to making the consumer believe that he could get plates of good quality for less than good-quality plates are worth. He has been constantly tempted by the offer of lower prices, and to this more than to anything else the demoralization of the trade is due. To this also is due the demoralization of the makers, who, in turn required to furnish plates at decreasing prices, have generally tried to save their profits by letting the quality deteriorate or by making their brands float an increased percentage of wasters. The result is that the great mass of tin plates imported under makers' brands are untrustworthy, and the consumer who has to make a judicious selection on his own judgment, is nearly as apt to be disappointed as if he chances it on the representations of dealers who know literally nothing whatever about the goods they handle.

Granted that there are makers' brands of tin plate which are carefully protected and which may always be trusted. The dealer cannot always get them, and, as we said last week, were the demand to concentrate on them, they would soon reach prices at which the consumer could not touch them. There are other plates which will as well meet the average requirement, but since the consumer does not know which they are, it is the business of the dealer to establish classifications which shall be accurate.

The dealer who does not dare to venture such a reform for fear he will not get back his expenses, confesses that his guarantee is worth nothing. In some cases this view of the matter is warranted, but there are a great many honorable houses whose guarantee would be accepted by the trade. For the cheap trade such a system as we propose has no value; very good, let it apply only to first and second-class plates, bright andterne, and leave the mass of cheap trash to go wherever low prices will carry it. A system of gradings such as we propose would also leave the dealer free to sell makers' brands of plates, when called for, without guarantees, and to this extent his business methods might remain unchanged. But he would also be able to offer the trade graded plates at graded prices, each grade guaranteed fully up to the quality standard announced for it, so that the consumer, without risk of disappointment or loss, can have the advantage of purchasing the tins imported under a great many brands he is now afraid to touch because he knows nothing about them. Some of these plates are good, and might be classed with plates commanding a higher price on the strength of established reputations. This would be a legitimate advantage of the dealer. Some would be worth less than they cost. This would put the dealer on his guard, and would soon cause the bad, doubtful or uncertain plates to gravitate to their own proper level as regards value. The consumer would gladly pay for all this. It would be cheaper in the end, and a great deal more satisfactory, to pay the increased price demanded for guaranteed plates, than to buy by brand and get "stuck," as often happens. In point of fact, the increased cost to the consumer of guaranteed plates over plates sold without guarantee, would be trifling, as competition among dealers to establish their own particular systems of grading would regulate the price in a very few weeks.

The introduction of this system depends upon the consumers. If they want it and demand it; if they refuse to buy anything in the way of plates purporting to be first-class or second-class unless the dealer guarantees the quality, the reform will come about easily and quickly. If they sit silent, waiting to see what the dealers will do, they will find the dealers will do nothing. We cannot bring the reform about without the active co-operation of consumers; with it we can stamp out every trick and fraud in the tin-plate trade and make the business honest throughout.

### The Wear of Steel Rails.

Some months since M. P. Escalé, a well-known French engineer, submitted an interesting communication on the wear of steel rails to the Société de L'Industrie Minérale. The paper embodied the results of experiments made by the author, and the first rails of open-hearth steel examined by him were manufactured at Tamaris for the Compagnie de Paris, Lyons et Méditerranée. The rails considered were on the line of Bourbonnais, between Gien and Montargis, and had been in use since the beginning of the year 1880, and though they had borne a traffic of about 2,700,000 tons, no defects were observed and the wear was inappreciable. It was therefore a matter of interest to know the chemical composition of these rails, and the average of analyses made of the steel at the time that the rails were manufactured was found to be as follows:

Carbon.....	0.499
Manganese.....	0.656
Phosphorus.....	0.150
Silicon.....	0.020
Total.....	1.325

The steel therefore contained about one-half of 1 per cent. of carbon, with 0.826 per cent. of foreign matters, which, added together, gives 1.325 per cent. of substances other than iron.

About one year ago Professor Gruner published in the *Annales des Mines* some remarks bearing on the subject of steel for rails, and from these it would appear that soft steel is more suitable for rails than hard steel, and that the softer the steel the less it will be affected by friction. The question then arises, whether the rails and the wheel rolling upon them may be considered as having a number of microscopic teeth, which break when the steel is very hard, and whether the friction which destroys a rail acts by breaking off small pieces or by a crushing action. A satisfactory solution of these questions would decide the superiority of soft or hard steels for the purpose in question. Professor Gruner, however, offers a more scientific explanation of wear and abrasion. He demonstrated that the wear is solely due to the greater liability of iron to oxidize when united with such elements as manganese, phosphorus and silicon, and stated that the wear of the rails increases with greater proportions of these three elements, or, in other words, the corrosive action of a moist atmosphere is more energetic in connection with hard steel than with soft steel. M. Escalé

cites the subjoined table of analyses given by Professor Gruner as very suggestive, and contrasts these figures with those obtained by analyzing the open-hearth steel rails previously mentioned. The figures given by Professor Gruner are the average results of analyses of 32 rails from the Pennsylvania Railroad, which were affected very little by the wear, and of 32 which were worn very much.

ANALYSES OF STEEL RAILS FROM THE PENNSYLVANIA RAILROAD.

	Average of analyses of 32 rails, worn very little, per cent.	Average of analyses of 32 rails, worn very much, per cent.	Rails manufactured at Tamaris, per cent.
Carbon.....	0.334	0.380	0.493
Manganese.....	0.491	0.647	0.652
Phosphorus.....	0.077	0.105	0.150
Silicon.....	Not deter'd.	Not deter'd.	0.020
Total.....	0.908	1.199	1.321
Total minus carbon.....	0.578	0.800	0.828

An inspection of this table will show that the rails least affected contained less carbon, less manganese and less phosphorus than those affected in a more marked degree, being, in other words, softer. The Tamaris rails, in France, be classified as soft rails, though, when compared with those from the Pennsylvania Railroad, they are really very hard. They contain more than 1 per cent. of foreign elements, which, though it makes them desirable in France, causes their rejection on roads in this country. It is at the same time observed that such rails are worn out more rapidly than those used in the United States, and according to the general observations on the road on which the Tamaris rails were laid, the mean wear of the rails is 0.

as long as his own goods move off with ease at a good profit. It has saved the consumer the trouble of anxiously watching the copper market at New York. The leading manufacturers have secured a supply to the end of the year at, it is stated, 18 cents per pound for Lake, and we do not look forward to any very great excitement till we shall get fairly into the new year, when the entire position of demand and supply will have defined itself. We shall thus have ascertained whether or not consumption has really developed in 1882 to the extent now asserted, or whether the outside Western copper is destined to weigh more heavily on our hands than has hitherto been apparent. As that period is, however, still tolerably distant, the metal trade, as a holder and future receiver of copper, looks forward with comparative unconcern.

We do not remember a year in which copper has been so devoid of exciting phases as the present one, both here and in Europe, whence the quotations have come per cable week after week with almost stereotyped uniformity, till the recent advance of £3 per ton. This certainly shows how little active interest the speculative element has taken in the metal and how well balanced the supply and the demand must have been all along. This steadiness is chiefly due, of course, to the new uses to which copper is put in the civilized world since the more universal introduction of the telephone and electric light, as well as other forms of electricity. Copper, on this score and others, may be safely pronounced a "fortunate" metal, while its production has been remarkably on the increase in this country, in Spain, at the Cape and in Australia. Chili, through the protracted war on the Pacific, has not been as great a producer as she was prior to the latter, whereas copper is now finding many important uses not thought of ten years since. General trade also favors the metal just at present. With the exception of England and Spain, crops in Europe have been fair, the entire yield being a good average one, and on this side they exceed the average of the last three years, so that the purchasing capabilities of the people on both sides of the ocean will be all that can be wished for. No political clouds of a threatening nature are discernible anywhere since Sir Garnet Wolseley pricked the Egyptian bubble, which at one time seriously menaced the peace of Europe. We therefore come to the conclusion that, at present prices, copper is in about as sound a position as it has been for a long time past. This seems to be all the more certain since, with the restoration of steady transit through the Suez Canal, the demand for copper manufactures for British India is actively resumed, materially favoring the raw copper market in London, and thus causing the advance above alluded to.

#### The New Austrian Tariff on Iron and Steel.

We give below the items of the new Austro-Hungarian tariff relating to iron and steel. This went into effect June 1 of this year. The values are given in florins per 100 kilograms, but we think that no difficulty in understanding it will be experienced when it is remembered that 100 kilograms are equal to 220 English pounds, and that 1 florin corresponds to 48 cents.

Raw iron; iron and steel, old, broken and in scraps for melting and forging. . . . . 0.50  
Note (1).—In consideration of circumstances of a local character, foundries using old and scrap iron may be permitted, with the consent of the Government of both parts of the Empire, to import old and scrap iron at the exceptional duty of 10 kreutzers for 100 kg., subject to a control of its appearance and the fixation of the maximum quantity.

(a).—Iron filings and hammer scales. . . . . Free.  
Loops; ingots. . . . . 1.50  
Iron and steel in bars, hammered or rolled:  
a. Not shaped. . . . . 2.75  
b. Shaped. . . . . 3.50  
Rods for railways. . . . . 2.75  
Sheet iron and iron plates; wire:  
a. Of the thickness of 1 mm. and more. . . . . 4.00  
b. Of the thickness of less than 1 mm. . . . . 4.50  
c. Varnished, coppered, tinned or coated with zinc, lead or nickel; sheet iron and plates polished. . . . . 8.00  
Ordinary cast iron:  
a. Pig iron. . . . . 9.00  
b. Scoured or coarsely painted; drilled or only in a few different places ground, twisted or planed. . . . . 4.00  
c. Ground, twisted, planed, coated with copper, tin, zinc or lead, enameled or finely painted. . . . . 8.50  
The goods under b and c, also with the necessary cast iron or connecting wooden parts.

Common iron and steel goods made from malleable cast iron, cast steel, wrought iron or steel, as far as they do not come under the following numbers:  
a. Coarse, also brightened. . . . . 4.00  
b. Coarsely painted, drilled, or ground in a few places, twisted, planed, with notches for the turning of a screw (also screw bolts and nuts). . . . . 5.00  
c. Ground, twisted, planed, or coated with copper, tin, zinc, lead, or finely painted. . . . . 8.50  
All these goods also in connection with wood or cast iron.

Wrought-iron pipes, also joints. . . . . 5.00  
Wrought-iron boilers, also steam boilers: perforated or grooved black sheet iron and plates; goods made of black sheet iron. . . . . 8.00  
Car-wheels, finished, also on axle trees. . . . . 6.00  
Nails and tacks, springs for steel vehicles, hay and dung forks, hatchets, shovels, (rough, brightened, or ground in some few places.) scythes, sickles, straw-knives; also in connection with wood. . . . . 6.50  
Wire rope, wire brushes, wire sieve bottoms, coarse wirework (made of wire of the thickness of 1 mm. and more). . . . . 8.00  
Ordinary tools for cutting and drilling, i. e., saws, planes and chisel irons, awls, gimlets, files, rasps, &c., cloth-makers' shears, coarse knives and scissors; all these for the use of mechanics and farmers (also machines); screws, locks; also ground twisted, painted, coated with tin, zinc, copper, or lead, or in connection with wood. . . . . 10.00

#### Fine iron and steel ware:

a. Polished, japanned, enameled, coated with nickel (except the common enameled cast iron named under No. 262 c); b. Artificial and light ornamental castings; c. Wirework not otherwise provided for; pins, hooking and knitting needles, tacks, books and eyes, buckles, fish-hooks, thimbles, and similar small articles; children's toys, skates, steel corals, scrapers of all kinds; sleighs, weavers' cards, springs, (watch and carriage springs excepted); d. Arms and parts of arms (fire-arms and gun-barrels excepted); cutlery, not otherwise provided for; e. Furniture, cushioned, covered, or finely ornamented; f. Iron and steel goods in connection with other materials. . . . . 15.00  
Fine cutlery steel pens, wire spun over with thread; gun-barrels. . . . . 30.00  
Guns, sewing needles. . . . . 30.00

#### The Holley Memorial Fund.

Mr. Chas. McDonald, treasurer of the Holley Memorial Fund, announces subscriptions received up to October 2d to the amount of \$3335, made up as follows:

Number.	Amount.	Total.
1	\$1,000	\$1,000
2	500	500
3	200	200
4	100	100
5	50	50
6	25	25
7	10	10
8	5	5
Total		\$3,335

We believe that this list would have been much longer and the total much larger if the impression had not gained ground that the heavy subscriptions would naturally come in first, and if those intending modest subscriptions had not generally preferred to wait until the larger ones had been made. It will be seen, however, that all have not felt in this way, and as the subscriptions received are by no means limited to large amounts, we hope that a great many will feel, as does the writer, that subscriptions from those whose modest means do not permit them to honor Holley's memory in the liberal way possible to some who profited most by the fruits of his labors, are both timely and acceptable. It is the wish of all who are connected in any way with the Holley memorial, that the subscriptions should be as general as possible, and that no one should feel constrained by the example of others to exceed the amount which he finds it convenient and agreeable to give. Nothing would be more distasteful to the large subscribers than to think that their liberality had caused any one else to withhold his name.

The past two or three weeks have witnessed a most important and marked advance in the price of petroleum, it having touched a higher point than at any time since July, 1880, at which time it was \$1.06 1/4, the highest price the past week being a fraction over 98 cents. The nearest approach to this since July, 1880, was in September, 1881, when it touched 97 3/16 cents. This is an advance of about 40 cents since August, the average price of oil in August, 1882, being 58 1/2 cents. The reason of this seems to be the large falling off in production in the territory, as the chief element in causing the low price was the immense supply. The Cherry Grove district, in Warren County, has apparently reached its highest production, and in the past three weeks has shown a decrease of from 10,000 to 20,000 barrels in daily yield. Other districts, whose production was in doubt, have been shown not to be very heavy producers, and the old districts are undergoing a gradual decline in production. Notwithstanding all this, however, there seems to be a production fully up to if not in advance of the consumption. Some of the best judges in the oil region still believe that there is a large amount of excessive production, which is likely to continue for a considerable period of time till consumption grows sufficiently to overtake it. The stock of refined in Europe is large as compared with last year, and the slowness with which the European quotations follow the advance in crude, and the tardiness with which the exporters are taking oil, plainly indicate a belief in Europe that the present advances are not likely to be maintained. However, oil is a thing that it never does to bet on.

A meeting of ironmasters in the North of England was recently held at Middlesbrough, and a unanimous feeling was expressed that the restriction of the output of pig iron should be continued for another six months, commencing on September 30. The Scotch ironmasters held their meeting one day later at Glasgow, also to consider the propriety of continuing the policy of the 12 1/2 per cent. restriction in the make of pig iron for six additional months, and the masters present were willing to continue the agreement. The directors of one company, however, had to be consulted, the representatives of that company having no authority to give a final decision, and no definite conclusion was, consequently, arrived at.

In our last issue we briefly mentioned Dr. Siemens's inaugural address as president of the British Association, and referred our readers to an extract from it in another portion of that issue. Owing to a press of other matter, however, it was omitted, and we therefore present the extract in question this week. The manner in which the subject is treated will, we think, be found both interesting and profitable.

#### Automatic Hatchways for Elevators.

We have received the following letter, which may be of interest to some of our readers:

PHILADELPHIA, Sept. 23, 1882.

To the Editor of The Iron Age.—DEAR SIR: In a recent issue we notice an illustrated article on "Automatic Hatchways for Elevators," and, in order that your readers may not unwittingly subject themselves to the payment of royalties for infringement of patent right, by using mechanism shown in the illustrations, we would state that we are the sole owners of patent No. 75,220, granted David B. Thompson, March 3, 1863, which secures the right to the bow, or inclined plane, placed at top or bottom of car to operate automatic hatchway doors, and any unauthorized use of same will be a direct infringement of said patent.

Very truly yours, CLEM & MORSE.

#### Vienna Meeting of the British Iron and Steel Institute.

The Vienna meeting of the British Iron and Steel Institute, which commenced on September 19 under most auspicious circumstances, was the fourth meeting of the Institute held on the Continent, and taking into account the distance of the place of meeting, the attendance (over 200 members having been present) must be considered very satisfactory. The original programme, which was circulated among the members some time previous to the meeting, was changed considerably, without detracting, however, from its entertaining and highly interesting character.

The different sessions were held in the rooms of the Austrian Society of Engineers and Architects, and the proceedings were commenced by the reading of a letter from Mr. J. T. Smith, the president of the Institute, in which he expressed his regret at not being able to be present. Several other prominent members, among them Sir Henry Bessemer, Mr. Thomas, Dr. Siemens and Mr. Martin, were also absent. In the absence of Mr. Smith, Mr. I. Lowthian Bell, well known in metallurgical circles, was voted to the chair, who, after a few preliminary remarks, invited Herr C. August von Frey, president of the local reception committee, to address the members. He was followed by the Statthalter of Lower Austria, Ludwig Freiherr Possinger von Choborsky, who welcomed the Institute in the name of the Government, and by the Burgomaster of Vienna. Mr. Bell having suitably replied, Mr. Bernhard Samuelson was elected president for the ensuing year, and the reading of papers was proceeded with. A presentation was made by the Prague Ironworks Company to Mr. Thomas in acknowledgment of the value of the Thomas-Gilchrist process, to which Mr. Gilchrist replied. The members then partook of luncheon in the Imperial Volksgarten, provided by the Austrian iron trade. In the afternoon excursions were made to the arsenal and to Naszdorf, from which place the members ascended the Kahlenberg, whence a splendid view of the city can be obtained. They were also shown by the Corporation the works intended to be carried out for improving the navigation of the river, and the banquet of the Institute was held in the evening.

The members met again on Wednesday morning, September 20, and the first paper read was that of Dr. Hermann Wedding, of Berlin, the subject being "The Prussian State Institute for Testing Iron and Steel and its Works." Another paper on "Recent Progress in the Manufacture of Steel Castings" was read, the remainder of the day being spent in excursions. The various other papers, mentioned in a recent issue, received attention on the following days, and the information derived from them, combined with the highly entertaining character of the excursions to different points of interest, formed the subject of favorable comment. Altogether, the meeting was one of exceptional interest, and some of the papers considered will receive further attention in our columns at no distant date.

**Cost of the East River Bridge.**—Comptroller Campbell, in his annual report, says: "The amount of cash furnished by the city of New York up to August 1, 1882, for the Brooklyn Bridge is \$4,671,900, being its full quota under the laws passed prior to 1882, and the amount furnished by the city of Brooklyn under the laws passed prior to 1882 is \$9,023,693.73, making the total amount of cash furnished by both cities to the present time, \$13,695,593.73. The cash furnished is exclusive of interest paid upon the bonds issued by the two cities. The amount of interest which has been paid by the city of New York upon its bridge bonds is \$1,492,031.52. Besides the amount already expended by the city of New York, and the amount of bonds authorized by Chapter 368 of the laws of 1882, to be issued by that city for the completion of the bridge, amounting to \$416,666.66, a further sum will be required for the erection of the portal at the terminus in the city of New York, estimated at from \$125,000 to \$150,000, to be authorized by future legislation.

According to the preceding statement and estimate, the proportion of the total outlay for the bridge by the city of New York for its final completion (exclusive of interest) will be in round numbers. . . . . \$5,250,000.00  
To which add interest on completion, 88 1/2 per cent. . . . . 1,750,000.00  
Total principal and interest, say . . . . . \$7,000,000.00  
The city of Brooklyn has expended in bonds issued and interest paid the sum of. . . . . \$2,974,031.44  
Add amount provided for by Chapter 368, laws of 1882. . . . . 833,333.33  
Also add amount to be provided for land and terminus portal by future legislation, say. . . . . 600,000.00  
Also add for interest on bonds up to completion of bridge, say one year. . . . . 600,000.00  
Total. . . . . \$11,007,364.77

"This amount being added as the proportion of cost for the city of Brooklyn to the amount of \$7,000,000, before stated as the cost for the city of New York at the final completion of the bridge, the amount cannot be less than \$22,000,000 for the total cost, including interest."

#### WASHINGTON NOTES.

(From Our Own Correspondent.)

WASHINGTON, D. C., October 4, 1882.

#### THE TARIFF IN THE SOUTH.

Advises received from different parts of the South show a radical change in public sentiment respecting the tariff, and this new departure from the old-time notions upon the great economic questions of the day, is beginning to have its effect upon the selection of candidates for political office and their chances of election. Such States as Louisiana, Alabama, Georgia, the Carolinas and even Texas, are beginning to expand in industrial development from the crude or isolated efforts of the past, in a systematic application of capital and enterprise to the vast resources of the country. The Atlanta Exposition seems to have opened the eyes of the people to the real necessities of the future and the advantage of a liberal industrial policy. The old-time politicians, whose stock in trade has been the constitution as it was, the memories of the war and sectional antagonisms, are losing their grip, and a new generation is coming to the front who are alive to the substantial needs of the South. From all accounts, this movement toward industrial regeneration is meeting with unmistakable success through popular support, and the South, which has hitherto with the West been regarded as the stronghold of free trade, promises to be a potential ally of the protection interests of the Middle and Eastern States, and should and will be of the whole nation. The wing of the old party which has dominated matters and adhered to articles of political faith which have been out of date for at least two decades, has formed new alliances with every prospect of success, and the tariff issue appears to be one of the main features of their platform.

#### THE NEW HOUSE OF REPRESENTATIVES.

In connection with this new movement in the South, the Congressional ticket becomes a matter of serious consideration. The next House of Representatives, under the ratio of representation established by Congress in accordance with the enumeration of inhabitants in the Tenth Census, places the number of Representatives at 325, instead of 293 as at present constituted, making the election of 32 additional members necessary. Of this number, 15 will come from the Southern States. The new movement in the South is directed toward capturing as many of these as possible, besides carrying some of the old districts. The independent Democrats and Republicans are generally uniting in this movement, and the ability of the independent Democrats to insure fair play at the polls will alone determine the result. The present Southern leaders in Congress, such as Tucker, are free traders of the extreme type, and nothing save a new deal will give the people in that section an opportunity to have less politics and more regard for material development, in their representation in the halls of national legislation. The reports received from the Southern States on this subject are generally favorable to such gains in Congress as will insure a fair representation of the growing interest in tariff for the protection of home industry. While speaking upon the subject of the next Congress in regard to the Southern members, it might be well to add, as the control of parties will have much to do with the tariff, that, as already stated, 15 of the additional members will come from the Southern, and the remaining 17 from the Northern States. The three Northern States, Maine, New Hampshire and Vermont, each lose a Representative. The overwhelming Republican success in Maine made up, by the gain of one member, the loss in the representation on the basis of population. In the other two States the loss comes out of the Republican list. Of the remaining 14 Representatives allotted to the Northern and Western States, 8 may be set down for the Republicans, with 6 to be elected in New York, Pennsylvania, Ohio, Illinois, Wisconsin and California, and about which there may be a doubt, and the loss of which would entirely change the political complexion of the next Congress, provided the relative strength of parties as it now exists be continued.

#### THE FREE TRADERS AND THE ELECTIONS.

There are no lack of charges that free trade interests are actively at work in certain Congressional districts in support of candidates whom they consider friends of their cause. It is even said that a liberal fund has been raised by British manufacturers to be used to further the election of such candidates. Whether the charges, as made, are true or not, there is no doubt that unusual efforts are being made to increase the number of those in Congress who are favorable to free trade as opposed to protection.

#### THE TESTS OF IRON AND STEEL.

General Campbell, chairman of the House Committee on Manufactures, is taking advantage of the recess of Congress to give his personal attention to furthering the interests of the bill unanimously reported by the committee for the creation of a commission to make certain tests of iron and steel. It will be remembered that this important measure would have passed under a suspension of the rules had all its friends and advocates been present. The vote then showed a large majority in its favor, so that whenever it is reached in its regular order it will pass without difficulty. General Campbell recently remarked, in reference to this bill, that he would call it up among the very first measures brought to the attention of Congress for action in December.

#### THE TARIFF COMMISSION REPORT.

Although the members of the Tariff Commission are making great exertions to complete their labors and to submit their report as soon as Congress assembles, so that there shall be no occasion for delay on their account, there seems to be a general impression among members of Congress who have been here, and who are in a position to know, that the prospects of disposing of this question at the coming session are exceedingly meager. It is claimed, in the first place, that

the session, by constitutional limitation, will expire in three months, and that the regular appropriation bills will consume every moment of that time. In event, however, of the tariff question coming up for consideration, there is sufficient free-trade influence to carry on the discussion against time, unless the Republicans and tariff Democrats should unite and force a result. The chances now seem to be that, while there will be some preliminary consideration of this subject, the determination of it will go over to the next Congress. For this reason it is generally conceded that the protective tariff interest should exert all its influence in favor of the election of proper representatives to the next House.

#### THE CRESSON CONVENTION.

Private letters received here refer to the differences which manifested themselves between the iron manufacturers and the producers of pig iron and iron ore, in regard to the duties on articles representing those interests. Those who have watched the course of the convention, and who are taking a lively interest in placing the duties on iron and its manufactures, in the most advantageous light, express some anxiety that the different interests may not act in harmony. The position of Mr. Morrell, though, abstractly speaking, perfectly legitimate in a business sense, put the protective interests in a somewhat embarrassed position, and for certain branches of the iron industries now to claim one thing for themselves and something else for other branches of the same industry, in the revision of the tariff, will be calculated to do a great deal of harm. The imports of iron and steel for the past year, as shown by official sources of information, are by no means diminishing. In the item of pig iron the increase of 1882 over 1881 was about 75,000 tons; bar iron about 20,000 tons, and steel rails about 35,000 tons. In the latter articles the importations aggregated 214,000 tons. The value of imports of steel ingots from which rails are rolled, owing to the Treasury decisions, rose from \$6,000,000 in 1881 to \$13,000,000 in 1882. The aggregate value of all the imports of iron and steel amounted in 1882 to \$66,000,000, as against \$57,000,000 in 1881. These figures in themselves are sufficient to suggest the wisdom of harmonious action. The free trade influence in Congress is in a somewhat desperate mood over the creation of the Tariff Commission, and will take advantage of every subterfuge and sophistry in their efforts to weaken the recommendations of the commission.

#### Mr. J. S. Moore's Tariff.

Mr. J. S. Moore, one of the most active and best known of the "revenue tariff" agitators, has submitted to the Tariff Commission the following scheme of a tariff, which will be read with interest:

**First Class (Textiles).**—He proposes an average duty of 25 per cent. on cotton manufactures, instead of 38 per cent.; on woolen manufactures, 45 per cent., instead of 67; silk manufactures, 45 per cent., instead of 58; flax manufactures, 25 per cent., instead of 35, and manufactures of hemp and jute, 25 per cent., instead of 27. The estimated revenue from this class at these rates would be \$41,000,000, against \$59,000,000 in 1881.

**Second Class (Metals).**—He recommends the following reductions: Pig iron, from \$7 to \$5 per ton; scrap iron, cast, from \$6 to \$5; scrap iron, wrought, from \$3 to \$2; steel rails, from \$28 to \$15; all other iron and steel and the manufactures thereof, from 40 1/2 per cent. ad valorem to 35 per cent.; all other metals and the manufactures thereof, except pig and bar lead and ingot copper from 30 per cent. to 25 per cent., and tin plates, from 11-10 cents per pound to 1/2 cent. The estimated reduction in revenue would be from \$27,000,000 to \$20,000,000.

**Third Class (Sugar and Molasses).**—He proposes two grades of duty—40 per cent. (instead of 55) on all sugar up to No. 13 in color, and 50 per cent. (instead of 70) on all sugar above No. 13. On molasses he proposes 5 cents per gallon instead of the present duty of 5 cents and 25 per cent. ad valorem. The difference in revenue would be from \$47,000,000 to \$34,000,000.

**Fourth Class (Brandy, Wine, Beer, &c.).**—The only change proposed is an increase on sparkling wine from \$6 to \$8 a dozen quarts, the estimated increase in revenue being from \$6,800,000 to \$7,200,000.

**Fifth Class (Tobacco).**—The only change proposed is from \$2.50 per pound and 25 per cent. ad valorem to \$3.50 per pound, the estimated difference in revenue being an increase from \$4,655,000 to \$5,432,000.

**Sixth Class (Earthenware and Glass).**—The changes proposed are as follows: On earthen, stone and china ware, from an average duty of 42 per cent. to 35; on window glass, from 70 to 40; on plate glass (above 24 by 60) from 50 cents per square foot and 110 per cent. ad valorem to 30 cents per square foot and 65 per cent. ad valorem; all other plate glass, 40 per cent. (the present rate), and on glassware of every description 60 per cent. (also the present rate). The estimated difference in revenue is a reduction from \$6,000,000 to \$5,000,000.

**Seventh Class (Spices of all Sorts).**—No change is proposed.

**Eighth Class (Chemicals and Dyestuffs, Except Opium).**—A reduction is proposed from 30 to 20 per cent., the estimated reduction in revenue being from \$4,000,000 to \$1,500,000.

**Ninth Class (Sundries, Including Paper).**—The proposition is to reduce printing paper (sized and glued) from 25 to 20 per cent.; printing paper, unsized, from 20 to 15 per cent.; writing paper from 35 to 25 per cent.; all other manufactures of paper (except playing cards) from 35 to 25 per cent.

Mr. Moore's plan proposes a free list to the amount of \$13,773,000, and estimates the total revenue under this proposed tariff at \$135,361,932. It provides that domestic alcohol, used in the preparation of chemicals, shall be free of internal revenue tax, and proposes that wherever it can be done the rates shall be made specific, established on the ad valorem basis. He said that the revision submitted was prepared by himself and acceded to by Mr. David H. Wells.

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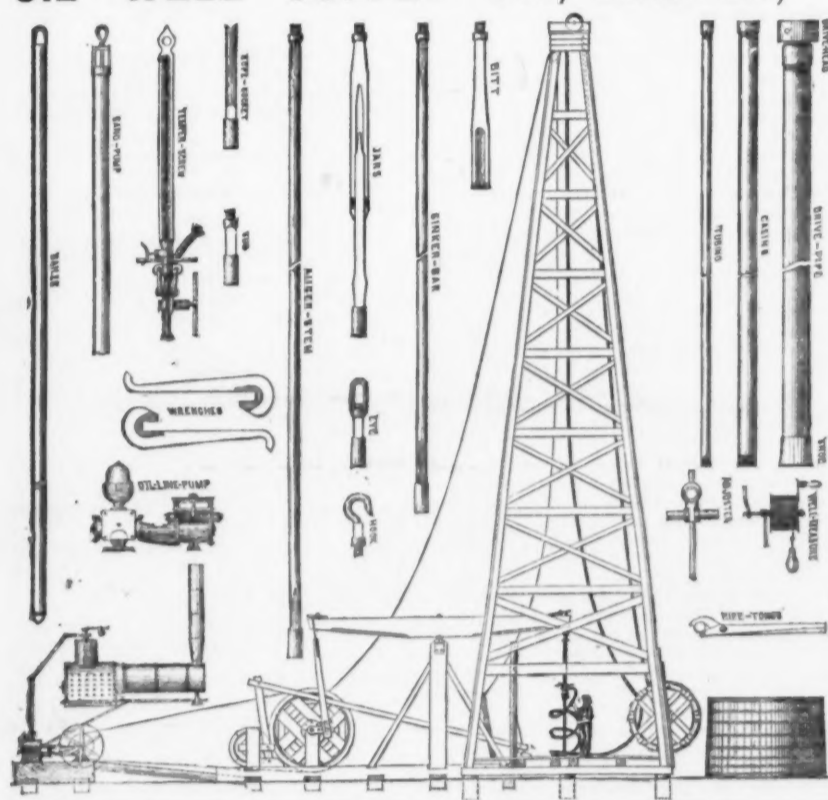
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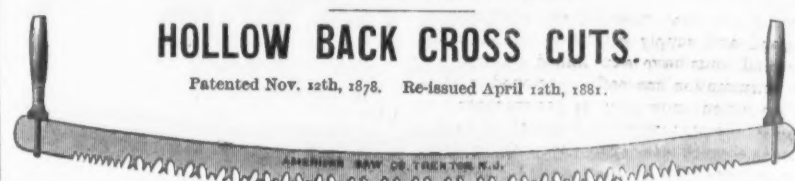
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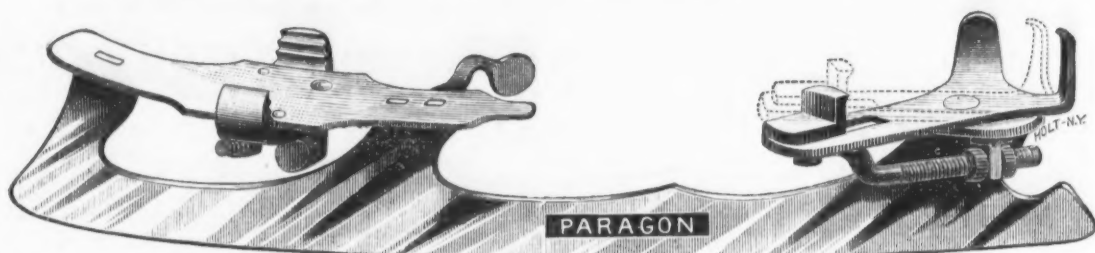
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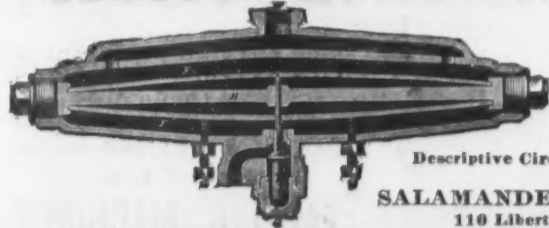


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## Reading as an Industrial Center.

The Board of Trade of Reading, Pa., has just issued its first annual report. It is an interesting document, containing a description of Reading as a place of manufacture and attractions as a place of residence, and contains a map showing the location of its industrial establishments and sites available for new ones.

THE DEVELOPMENT OF THE PHYSICAL RESOURCES OF THE SURROUNDING COUNTRY.

After dwelling at sufficient length upon the geographical, topographical and metallurgical advantages presented by Reading, the report traces the development of the region lying within the amphitheatre formed by the carboniferous and metalliferous elevations of the Blue and South Mountains, and comprised within the county of Berks, of which Reading is the shire city. The city itself lies at the foot of Mount Penn and along the eastern bank of the Schuylkill River. The plat embraces 4558 acres, and the extent of river front available for manufacturing purposes is 4.82 miles. In addition to the population of 43,280 souls, there are 9 boroughs, ranging in population from 200 to 2000 inhabitants, and 59 villages containing from 100 to 1000 persons. Each of these centers of population is the location of some important industry, dependent upon Reading as the metropolis of the county. The total population of the county in 1880 was 121,599 souls. While the bulk of the first settlers were Germans, but one-twelfth of the population of to-day is foreign born. The aggregate of taxable property in the county by the census of 1880 was \$59,331,713, of which \$19,343,858 belonged to the city. The total debt of the county in 1880 was reported at \$184,604, and of the city \$1,125,207, more than half of which was expended in increasing the water supply for manufacturing purposes. The rate of taxation on private houses and manufacturing establishments is \$1.83 per \$100; business houses, \$1.35, and unimproved property, 95 cents per \$100.

THE FACILITIES OF TRANSPORTATION.

The report shows that Reading has exceptional advantages of transportation to terminal and intermediate points on through lines. The railroad system of the country, and of which Reading is the center, comprises 145.8 miles of main line in operation, 249.6 miles of second and side tracks, and 100 miles of projected road. This includes the vast system of the Philadelphia and Reading Company and the Wilmington and Northern Railroad. The Reading and Chesapeake roads will bring the city into direct communication with the trade of the Chesapeake and South Atlantic ports and South generally. The South Mountain Railroad will give the city direct relations with the trade of New York, New England and Canada, by way of Poughkeepsie, on the Hudson, and the South and West via Harrisburg, on the Susquehanna. The Oley Valley and Lehigh also brings the city into direct communication with the valuable agricultural and mining sections of Eastern Berks, and will form a connecting link between the Lehigh Valley and the Pennsylvania Railroad systems. It is also shown that the city is highly favored as regards freight rates. In addition to railroad facilities it also enjoys water communication by canal with Philadelphia and New York.

WATER AS AN AGENT IN MANUFACTURES.

The city of Reading is also admirably situated with respect to water. The site of the city stands at the point of confluence of the main streams with the Schuylkill, and therefore possesses an inexhaustible supply of this important element. The census of 1880 gives the statistics of the utilization of the natural forces of water as a power in manufacture. The city and county give 348 industrial establishments employing 331 water-wheels, representing 4266 horse-power, and 465 boilers and 211 engines, representing 13,007, or an aggregate hydrodynamic action equivalent to 17,273 horse-power, and with an unlimited power still unapplied. The water supply of the city for municipal and industrial purposes amounted in 1881 to 6,100,000 gallons, or 141 gallons per inhabitant, and places Reading second, Washington being first, in this respect, in the United States and Europe. The supply still available by the same means, that is by gravity, from the basins collecting the mountain streams, is practically without limit.

THE CONVENIENCE OF FUEL.

The report shows that fuel for manufacturing purposes can be had at a minimum cost, the vast anthracite coal fields of the Schuylkill Basin lying within 30 miles of the city, with almost unlimited means of transportation.

THE MINING INDUSTRIES.

The report gives a brief resume of the metalliferous wealth of the contiguous region. The supply of iron ores of the three leading varieties, magnetite, hematite and leonite, ranging from 37 to 63.75 per cent. of metallic iron, is inexhaustible and produces not only a quality of iron equal to the best grades of Swedish, but is especially valuable in the manufacture of Bessemer steel. These ores are found in almost every township. In 1880 the output of iron ore in the county contiguous to Reading was 252,940, being the third county in the State, with the first in rank, Lehigh, lying on its northeastern and the second, Lebanon, on its southwestern boundaries. It might also be mentioned that 53 distinct minerals, a list of which is given, have been found in marketable quantities, or decided traces, within the limits of Berks; these include, in addition to the three principal ores of iron, kaolin, or porcelain clay, of very superior quality and in large quantity, gold, copper, antimony, plumbago, lead, zinc, serpentine, mica, black mica, pyrolusite, gypsum, alabaster (white gypsum), garnets, rare zircon, noble serpentine (precious), malachite, calcite and rock crystal, fluor spar and quartz of common and rare varieties.

THE METALLURGICAL INDUSTRIES.

In the manufacture of iron it is shown that Berks County was the birthplace of this great industry in Pennsylvania, the first successful attempt at ironmaking having been made by Thomas Rutter, a German smith, in 1720, on the banks of the Manawtawny, three miles from Douglassville, and

in the present County of Berks. Since that time the county has kept pace with the development of this important industry, in 1880 ranking eighth in the whole United States, the production of pig and rolled iron and blooms aggregating 213,580 tons, or nearly one-half the product of the whole State of New York. The furnaces in that year numbered 27 stacks, producing 123,833 tons of pig iron, at an average cost of \$2.35 per ton for wages. In this product in the State Berks was second in the number of stacks and fourth in the tons produced. In the same year, in the State of Pennsylvania, Berks had 5 out of 19 bloomeries, ranked third in rolling mills, second in stove foundries, and among the first in iron foundries. From advance sheets of the Census Report of 1880, yet unpublished, it is ascertained that the aggregate extent, value and importance of the metallurgical industries of Berks were as follows: 45 establishments; capital, \$6,864,783; value of materials, \$7,658,112; value of products, \$10,178,612. Of this aggregate the city of Reading has the larger share. The census also gives the following summary of all industries of the county of Berks: 877 establishments; capital, \$11,008,173; hands over 16 years employed, 7977; wages paid during the year, \$2,962,025; value of materials, \$11,394,180; value of products, \$18,042,650. This does not include distilleries and breweries, both important industries, and a number of others upon which special reports are to be made. The proportion belonging to the city is: 301 establishments; capital, \$3,861,256; hands, 3437; wages paid during the year, \$1,284,582; value of materials, \$4,245,176; and value of product, \$7,237,914. There are certain industries not included in this.

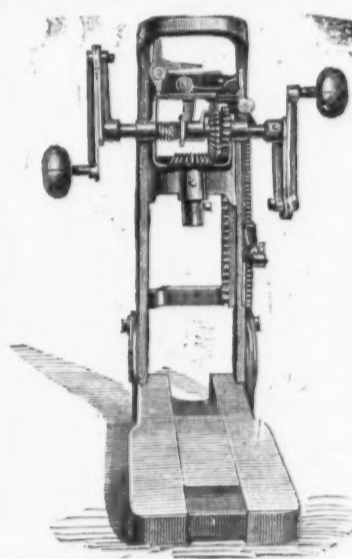
The table of manufactures of the city prepared by the Board of Trade to December 31, 1882, gives an aggregate of 455 establishments; capital, including value of real estate, \$10,712,463; hands employed, 11,798; wages paid during 1881, \$4,183,521; and value of products, \$17,600,313, which is a large increase over the census enumeration.

FOOD SUPPLY AND WAGES.

On the question of food supply and wages the report presents a review of the vast agricultural resources of the region tributary to Reading, and also by a comparison of rates of wages demonstrates that in this respect labor is remunerated at less than the maximum and more than the minimum rates shown by official returns from the principal manufacturing counties in Pennsylvania. Therefore it shows, with cheap and abundant food and a fair average rate of wages, coupled with inexhaustible resources of raw materials and water, and vast facilities of transportation, that Reading presents advantages for manufacturing possessed by few cities in the United States.

## Improved Boring Machine.

The Wells Manufacturing Company, of Ashway, R. I., are now putting upon the market the improved boring machine shown in the accompanying engraving. One special feature of this improved machine is the construction of the cranks. By means of the peculiar joint uniting the two arms of the crank it is possible to make them of almost any desired length. As shown in the engraving they are at their shortest. By straightening the arms out, which is done simply by loosening the bolt at the joint, a crank several times the length of that shown is obtained,

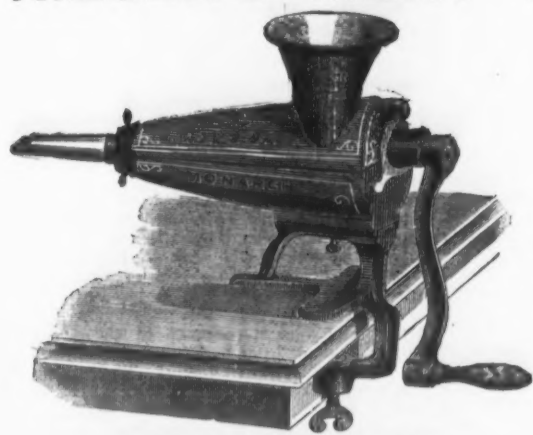


Wells Boring Machine.

thus increasing the leverage. The machine is provided with an adjustment connecting the frame with the base, by which holes may be bored at various angles. The reverse motion of the machine by which the bit is withdrawn from the hole is positive in its action and very satisfactory in its working. The stop for limiting the depth of hole is shown at the right in the engraving. From the testimony of carpenters who have used this machine and who have compared it with other devices that they have employed, it would seem to meet a well-defined want and be destined to become very popular. The working parts of the machine are very clearly shown in our engraving, and will be readily understood by all who will examine the cut attentively.

Germany and Austria formerly obtained their surgical instruments from London or Paris; now Berlin and Vienna are able to supply all needed appliances, and in the Bavarian university cities especially the industry is carried to considerable perfection, the number of firms so engaged in 1875 having been 61, employing 129 persons.

Experiments have lately been made in Sweden of crushing blast-furnace slag into sand, to be utilized for road and railway making, &c., and a machine has just been constructed by the Ringshtyttan Iron Works which is stated to be very effective.

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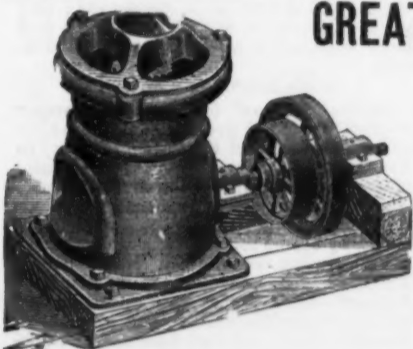
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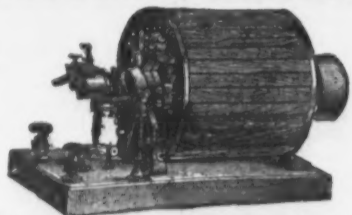
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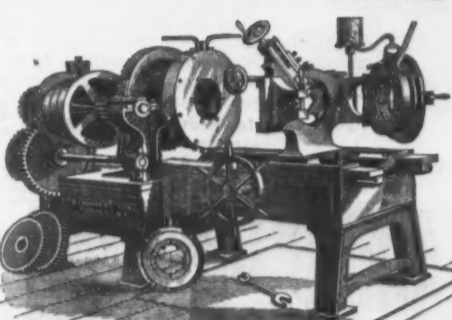
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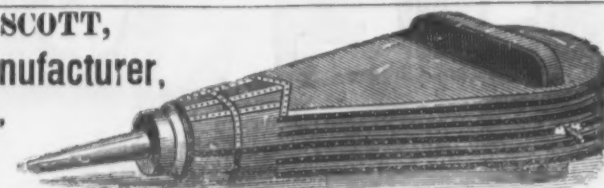
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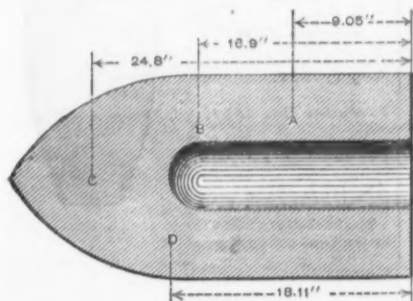
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## METALLURGICAL NOTES.

## The Effects of Compression on the Hardness of Steel.

Our readers will undoubtedly recall a brief notice which appeared in our columns a short time ago relating to a method of tempering steel by compression, described before the Académie des Sciences, Paris, by M. Clément. Observations similar to those made by this gentleman have been recorded at the Saint-Jacques Works, at Montluçon, where the system of compression, as practiced by Mr. Whitworth, of England, has been in use on a large scale, for the past five or six months. The steel when in a liquid condition is subjected to a pressure of from 14,000 to 20,000 pounds per square inch, this pressure being maintained until the mass has solidified and cooled. The process, therefore, differs from that proposed by M. Clément, in the initial state of the steel, but in both cases the same results are obtained, the hardness of the steel being increased by pressure. The hardness increases with the proportion of carbon and may be readily observed in steels containing from 0.5 to 0.8 per cent., but less readily in steel containing less than 0.5 per cent. It was found that the proportion of carbon chemically combined to the whole amount in the metal was always greater in the compressed than in the ordinary steel. The steel with which experiments were conducted was cast in the form shown in our annexed engraving, and one casting was cooled under pressure while the other was allowed to cool in the ordinary way. Samples were then taken from the different points A, B, C and D, and the combined carbon was determined by



Effects of Compression on Hardness of Steel.

means of Eggert's process, while the total percentage was obtained by Boussingault's method. In the subjoined table we give the results of one of these tests, which may be accepted as a fair average:

	Compressed steel.	Ordinary steel.
	Per cent.	Per cent.
Carbon (total).....	0.70	0.70
Carbon (combined) at A...	0.60	0.49
Carbon (combined) at B...	0.59	0.50
Carbon (combined) at C...	0.55	0.47
Carbon (combined) at D...	0.60	0.50

The average of combined carbon in the compressed steel was therefore about 0.55 per cent., against 0.49 per cent. in the ordinary steel. The free carbon in the former amounted to 0.15 per cent. and in the latter to 0.21 per cent. Similar results may be obtained when certain kinds of cast iron and steel are cooled very rapidly by pouring them in iron molds.

## The Position of the Tuyeres in Blast Furnaces.

Among the different papers read at the recent meeting of the Institution of Mechanical Engineers, at Leeds, England, was one on "The Working of Blast Furnaces of Large Size at High Temperatures, with Special Reference to the Position of the Tuyeres," by Mr. Charles Cochrane. This paper embodied matters of such general interest as to justify its more lengthy notice. Mr. Cochrane stated that investigations during the past 10 or 12 years into the working of blast furnaces in the Cleveland district have been chiefly directed—in the case of furnaces of various capacities and employing various temperatures of blast—to comparing the fuel consumed per ton of iron made, and the temperatures and relative production of carbonic acid and carbonic oxide at the tunnel-head. From these investigations conclusions have been drawn which were not favorable to the employment of either very large furnaces or very high heats, an impression having once been very general that a furnace of 12,000 cubic feet capacity, and with a temperature of blast of 1000° F., was in the most favorable condition for successful working in the Cleveland district. Even so late as 1881, in a handbook of Middleborough and district, this view is advanced, the capacity quoted being only varied by 500 cubic feet. In all the discussions which have taken place, it would appear that two important elements in the successful working of a blast furnace have been overlooked or altogether ignored—namely, the size of the hearth and the overhang of the tuyeres, or, as it may be put by preference, the distance of the tuyeres apart across the hearth. The experience gained by Mr. Cochrane during the past eight years, and his special observations during the last two of these, point to the fact that in the employment of high temperatures of blast the distance of the tuyeres apart from nose to nose is of great consequence, and that if they approach too close together the effective capacity of the furnace is materially reduced. This reduction may easily go so far as to destroy the economy which should have resulted either from extra cubic capacity of furnace or from extra temperature of blast employed. In this way a furnace of 20,454 cubic feet actual capacity has been lowered to only 12,000 cubic feet effective capacity, and the consumption of coke increased from about 21 cwt. to about 25 cwt. per ton of iron made; in other words, a furnace of only 12,000 cubic feet actual capacity, working efficiently, would have done as good duty as the furnace of 20,454 cubic feet capacity actually did.

Again, in a furnace of 35,013 cubic feet actual capacity the effective capacity has been reduced to 26,000 cubic feet, and the coke consumed per ton of iron has been raised from 19½ cwt. to 20½ cwt., besides

other satisfactory results, consisting of a somewhat diminished make of iron, and the occasional production of an over-gray quality. Mr. Cochrane's observations have extended to four furnaces—No. 1 furnace is of 33,400 cubic feet capacity; No. 2 furnace is of 35,013 cubic feet capacity; No. 3 furnace is of 20,454 cubic feet capacity. No. 1 furnace was constructed with a hearth of 10 feet diameter, and an overhang of 16 inches of tuyeres, making the distance apart of opposite tuyeres 7 feet 4 inches across the hearth from nose to nose. It was blown in on March 18, 1874. No. 2 furnace was constructed with a hearth of 8 feet diameter, and an overhang of 12 inches of tuyeres; making the distance apart from nose to nose 6 feet. It was blown in on May 10, 1876. In June, 1880, the tuyeres at this furnace were each drawn back 8 inches, making the distance asunder of the tuyeres, from nose to nose, 7 feet 4 inches. No. 3 furnace was constructed with a hearth of 8 feet diameter, the distance from nose to nose of tuyeres being 6 feet, and was blown in on November 27, 1876. No. 4 furnace was constructed exactly as No. 3, and was blown in on January 8, 1880. At the end of January, 1882, the tuyeres were drawn back to a distance of 7 feet apart, with what excellent results we shall presently see. Commencing with No. 4 furnace, the tuyeres of which, till the end of January, 1882, had been only 6 feet apart, and, during the months of February and March, 1882, were separated to a distance of 7 feet apart, the following were the remarkable results obtained: The make, which had been limited to an average of 483 tons per week over the preceding months of November, December and January, rose in March to 599 tons per week, while the gross consumption of coke was only increased by 27 tons, or from 603 up to 630 tons per week. The tuyere area was unaltered, being 141 square inches total. The temperature of escaping gases at the tunnel-head in March was 100° F. less than before the withdrawal of the tuyeres, viz., 617°, whereas previously it had been 717°; while the temperature of blast was increased by 109°, being 1321° in January and 1430° in March.

The result of the tuyeres protruding too far into the furnace is that a larger volume of heated and expanded gases per square foot of transverse sectional area must necessarily be developed up the center of the hearth than at its circumference. If we consider the form of the hearth, and the temperature and pressure of the gases within it, this point will become clear. In No. 4 furnace, after the tuyeres had been drawn back so far as to be 7 feet apart, pressures were observed within the furnace as follows: At center of hearth, 2½ pounds per square inch; at 1 foot back from center, 3 pounds per square inch; at 3 feet back from center, 3½ pounds per square inch; at 4 feet back from center—i. e., inside the muzzle of blast pipe, 3½ pounds per square inch. The pressure of blast at the plug-hole, before and after the experiments, was 3½ pounds per square inch. It will thus be seen that there is a steady reduction of pressure from 3½ to 2½ pounds, or a total reduction of ½ pound from the circumference to the center of the hearth. A first impression might lead to the supposition that no such extra volume of gases as alleged above could approach the center, but the fact is that the pressures indicated at various points of the hearth have little to do with the volume there ascending. The totality of those pressures over the whole area of the hearth indicates probably the total resistance of the materials above to the passage of the gases; but this total resistance does not prevent a more rapid ascent in one part of the hearth when compared with another.

Thus around and above the tuyeres it may be assumed that there is a comparatively still region, in which little or no upward current takes place, and where coke is friable, as it is in some iron-producing districts; it will collect as dust in the quiet corner formed between the projecting tuyere and the wall of the hearth, and will sometimes, if not frequently, require removal. No one has established more thoroughly than Mr. I. L. Bell the fact that there is a limit to the power of reduction of ore by a mixture of carbonic oxide and carbonic acid gases. When the mixture becomes surcharged with carbonic acid, its reducing action ceases. The central column of reducing gas, created by the proximity of the tuyeres when only 6 feet apart, must necessarily reduce all the ore in the line of its passage, and although it does not become saturated with carbonic acid, it can yet reduce no more, because no more lies in its path. But between the central column of reducing gas ascending at high velocity and the walls of the furnace there remains an annular space charged with materials needing reduction, but to which the requisite volume of reducing gas cannot gain access. Thus we have the explanation of a large furnace doing only the duty of a smaller one. This arises from the circumstance that the hearth, or rather the arrangement of the tuyeres, has not been duly proportioned to the cubical capacity of the furnace.

The day on which the work commenced of drawing back the tuyeres at No. 4 furnace of 20,454 cubic feet capacity from 6 to 7 feet apart from nose to nose, the slag turned gray, indicating a much higher temperature in the hearth; and it was necessary to cool down the heated blast by an admixture of cold air until the heavier burden of ironstone and limestone, which the furnace ultimately proved itself capable of carrying on a standard weight of fuel, had worked its way down to the hearth. The result of drawing back the tuyeres from 6 to 7 feet apart was in fact to prevent the centralization of heat, and to bring about a uniform or more nearly uniform distribution of the ascending gases over the whole transverse sectional area of the furnace. Occasionally an accidental, and at the time inexplicable, production of glazed iron took place at this furnace, before the tuyeres were drawn back, and it is believed this was due to an accidental increase of temperature in the through concentration of heat, by which the iron and slag became overheated toward the central part of the hearth, while the bulk of the cast would present no exceptional appearance. Under the altered conditions of the tuyeres, when placed 7 feet apart, none

of the ore is subject to the influence of a greater volume of gas than is needed for its reduction, nor is any deprived of the volume needed to effect its reduction. Thus all the materials arrive at the hearth in a similar condition, equally ready to enter the region of fusion, over the area of which the temperature is practically equable, and the volume of ascending gases per square foot of sectional area is practically the same. The main improvement in the output of iron, namely, the increase of the weekly make from 483 tons to 599 tons, was due to the fact that whereas the 483 tons of iron formerly required 603 tons of coke, or 24.98 cwt. of coke per ton of iron, there are now produced 91 tons extra iron (making 574 tons of iron) with the same weight of coke, and also 25 tons more iron with 27 tons additional coke, due to extra driving. The average total of 599 tons of iron per week was maintained throughout the month of March, 1882.

We now proceed to consider the case of No. 2 furnace, of 35,013 cubic feet capacity, 90 feet high, 28 feet bosh, with tuyeres 6 feet apart only, i. e., overhanging 12 inches in a hearth originally 8 feet diameter. The greatest diameter of 28 feet was attained at a height of only 32 feet from the floor of the hearth. It might be expected that such a furnace would reveal marked symptoms of the want of diffusion of the ascending gases, under conditions of pressure and temperature of blast like those to which No. 4 was subjected prior to drawing back the tuyeres in June, 1880, the effective capacity being then so low as 18,600 cubic feet. The effect of the drawing back of the tuyeres to 7 feet 4 inches from nose to nose was to enlarge the area of the circle inscribed within the noses of the tuyeres in the ratio of 36 to 53.8, giving 49 per cent. more area for the descent of the material into the zone of fusion and for the diffusion of the gases. With a recorded average temperature of blast 73° higher in No. 1 furnace than in No. 2, the effective capacity of both Nos. 1 and 2 furnaces was approximately 25,640 cubic feet, against 33,400 actual in the former case, and 35,013 in the latter. This failure to realize the full advantages of these larger actual capacities arose mainly from a reduced blast pressure, through deficiency in steam supply. Now that a steady supply of blast is obtainable, the nearly full efficiency of both furnaces is manifested by the production of a ton of No. 3 iron at No. 1 furnace with 18.70 cwt. of coke, the temperature of the blast being 1406°; at No. 2 furnace by the production of No. 3 iron with 18.67 cwt. of coke per ton of iron, the temperature of the blast being 1465°.

It may be asked, Is there a limit, and if so, what is the limit, to the advantages obtainable by drawing back the tuyeres? An experiment on this point was made, and it would appear that for furnaces of such magnitude (90 feet high, with 28 feet to 29 feet bosh, and with 3½-pound to 4-pound pressure of blast) the tuyeres attain their maximum efficiency at a little beyond 7 feet apart, the precise distance being a matter of practical observation by the process of trial and error. The effect of extra pressure of blast is, as might be expected, to drive in the point of maximum temperature toward the center; but only to the slight extent of an inch or two for an increase of 1 pound or more in the pressure of blast. The effect, however, of diminished temperature of blast in driving this ring of maximum intensity inward is most marked. Whereas, with blast at 1200° to 1300° the ring is at a distance of 14 inches from the nose of the tuyere, if the temperature be lowered to about 350° the ring penetrates inward to a distance of 17 or 18 inches from the nose of the tuyere. These observations bring out clearly the relative importance of the effects resulting from extra pressure of blast, from diminished temperature of blast and from closer proximity of the tuyeres. Thus an extra pressure of about 1 pound in blast at same temperature pushes the point of greatest intensity only an inch or two inward. If the temperature of blast be lowered to 300° or 400°, the point of greatest intensity is pushed in 3 inches or four inches, so as to be 17 inches or 18 inches from the nose of the tuyere, instead of 14 inches. But if the tuyeres themselves be pushed in, the direct effect is to reduce the diameter of the hearth by the same amount; so that when, as was actually the case at Nos. 2 and 4 furnaces under the conditions described in this paper, the tuyeres were only 6 feet apart, the diameter of this circle of most intense action was diminished from 4 feet 8 inches to 3 feet 8 inches; and an intense upward central movement of the gases was the result, the ring of greatest heat being thus prejudicially forced inward toward the center of the hearth. Mr. Cochrane, after the reading of the paper, said he might add that the drawing back of the tuyeres to the extent of 6 inches was worth annually about \$15,000 in the saving of fuel alone.

## Plating Iron and Steel with Other Metals.

Mr. Carl V. Reusch, of 93 John street, is now introducing into this country a new method of plating iron and steel with metals and alloys which can be rolled at a red heat, and of plating such metals and alloys with each other. The trouble hitherto experienced in successfully carrying out this operation arises from the fact that the oxidation of the metals during the preliminary process of heating prevents a perfect weld. Partial success in this direction has been attained at different times, but only through an exercise of care which could not be relied upon in regular working, and accordingly iron and steel articles plated in this manner were unreliable and in many cases defective. The new method avoids oxidation, which is the main source of trouble, by the use of a metallic chloride which volatilizes at a red heat, (for instance, chloride of zinc or muriate of ammonia), and aims at a still more perfect union of the two metals through a coat of tin foil placed between them as a welding metal. A flat bar of iron or steel, treated in this manner and enveloped in the plating metal, is brought to a red heat and drawn to any required dimension between cold rolls. The plated metal is claimed to stand stamping, hammering, bending and drawing without any injury, and the process is said to be applicable to all metals or alloys that can be

drawn or rolled at a red heat or to the plating of the latter with one another. We have been favored with several small samples of steel plated according to this method, and would say that they look very well and show an apparently perfect weld. The method has been invented and patented in several countries, including the United States, by Mr. Herman Reusch, of Dillingen-on-the-Saar, Germany, and its highly satisfactory working will probably insure its extensive adoption at no very distant time.

## Quick Transit Steamships.

The American Quick Transit Steamship Company, about which so many paragraphs have recently appeared in the newspapers, have just launched a mastless steamer called the Meteor, intended for making the most speedy passages across the water. She is expected to sail from Boston in October, and it is believed the trip will be made in about six days. The idea in the steamship is precisely the reverse of that which governed the designers of our older sailing vessels and early steamships. In those models the idea was to make the vessel ride or lift herself over the sea. The more modern idea is to drive the vessel by "brute force and stupidity" through the water, regardless of the seas which are expected to sweep the deck in heavy weather. The new model, like the sloop steamer, is intended to go through the water, but neither to lift it nor to allow it to come on board. To prevent this a dome is placed over her, and the model is said to be without any legitimate deck. With the hull thus protected the waves will be passed through without great resistance, the water flowing aft without doing any damage to the vessel, or causing any great resistance. The Meteor is small, registering only 512 tons carpenter's measurement, and being only 156 feet over all, with 21 feet 6 inches breadth of beam, and 16 feet 6 inches depth of hold. She is only 132 feet 6 inches on the water-line. The steam pressure is said to be 500 pounds. This is to be utilized by four cylinders of 2-foot stroke. The high-pressure cylinders are 10 inches and the low-pressure ones 20 inches in diameter. These are supposed to be capable of making 350 revolutions per minute, which, with the usual discount of 10 per cent. for slip of screw, would give the vessel a speed of 30 miles per hour or upward. The projectors hope that she will make 25. We cannot, however, figure out a sufficient horse-power from the data given to make us feel very sure in regard to the speed the vessel will attain.

The Company are going to work as though they meant business. Mr. Waldo Adams, of Boston, is the president, and Perry Bliven, of New York, the constructing engineer. The company have purchased about 27 acres of land at Bay Ridge, and have a water front of 715 feet near the Manhattan Railroad Co.'s property. The front will be filled for about 700 feet to secure deep water. If the Meteor proves herself as speedy as it is hoped she will, other vessels will be built immediately of large tonnage. The material will be steel, and they will be fitted up in the very best style. Whether the model which they have adopted for their vessel is the model of the future, we do not know. It seems certain, however, that an ocean steamer arranged without masts, and designed to go through instead of going over the seas, would meet very much less resistance than the bluff-bowed ships that are now employed. Those familiar with the style of bow used on the wooden ships of 25 and 30 years ago, cannot but be surprised when they consider the form which most iron vessels have at the bow above the water-line. They seem designed with special reference to producing a heavy shock in going through a sea. The great length of the hull precludes the idea of the bow raising very much, hence the old form of bow is in one sense impracticable, but it would seem as though our alternative would be to allow the wave to travel aft, and divide it quietly and easily by a cut-water not unlike the lines of a vessel from the water-line to the keel. In other words, it would seem as though the back of a fish would make a better bow for a vessel than the present style. If this reasoning is correct, the form given to the Meteor ought at sea to show very much less resistance than that of ordinary vessels.

**Foreign Iron Ore.**—Mr. John F. Quarles, late United States consul at Malaga, who was present at the New York meeting of the iron ore producers mentioned in a recent issue, was at the time invited to give the meeting the benefit of his knowledge of the matter. In the years 1880 and 1881 Mr. Quarles was a special agent of the Treasury Department for the purpose of gathering data and obtaining general information in regard to the importations of foreign iron ore into the United States. In the course of his remarks bearing upon the subject he made the following statements: "The iron ore deposits of Spain, from which large quantities of ore are now being brought into this country, are practically inexhaustible, and the same might be said of the other iron mines on the Mediterranean. The ore is extracted from the mines and conveyed to the seaports at a comparatively small expense. Some of the mines are on the borders of the sea, so that the ore is loaded directly into the vessel. The freight on foreign ore is no protection, for it is constantly varying, and is generally so low that it costs less to get a cargo of ore from Spain than it does to bring it over the railroads from home mines. Every large grain crop in America causes a large reduction in the freight rates for ore. Vessels are anxious to come to this country for grain, and will take a cargo of iron ore for almost nothing. There is now a syndicate formed, of which Alfred Earnshaw, of Philadelphia, is agent, to take a very large number of tons of iron ore annually from the iron mines on the Mediterranean. They propose to establish three lines of steamers to bring the ore to this country."

From a private letter received in this city, it appears that the Intelligence Department of the English War Office were sadly misinformed as to what guns the Egyptians had at Alexandria. They gave it out that the English Navy would have to encounter nothing

heavier than some old 64 pounders, and a few 9-inch 12 ton guns of the old Woolwich pattern. Admiral Seymour must have been unpleasantly surprised to find the Superb pierced in two places in her armor, and two guns of the Temeraire destroyed. The mystery was explained when the spiking party on landing found fifteen of the newest pattern Armstrong breech-loaders, 10-inch, of 25 tons in one fort alone. Evidently Mr. Arabi has—luckily for the English—worse artillery than he has ordnance. A comparison between the old Woolwich pattern and the new Armstrong gun shows as follows:

	New.	Old.
Caliber, inch.....	10	10
Weight, tons.....	18	25
Powder charge, lbs.....	70	150
Weight of projectile, lbs.....	400	400
Energy total foot, tons.....	5,160	11,004
Thickness of plate pierced, inches.....	13.1	18.5
Thickness of plate pierced at 1000 yards, inches.....	12	7.13

## The Westphalian Iron Trade.

A correspondent of a German paper writes that both the iron and coal industries of Rhenish Westphalia are now extremely brisk, but that the eagerness with which prices are being forced up may cause the present activity to be of short duration. The progress in the transfer of private railways to the Government has lent a new impetus to the industry, since the companies, in view of Government purchases, have for years past kept their outlay on renewals within exceedingly narrow limits, and the Prussian Government has consequently for some time been giving out very large contracts for railway material. Constructive activity has also experienced a remarkable increase within the past few years. The extension of mining in the coal districts has given rise to important orders for hoisting apparatus and other mining appliances, and the destruction by fire of old coal-pit appliances and sheds has also increased the demand, as in all reconstructions of this nature wood is now being replaced by iron. The improvement of the loading and transporting arrangements in coal districts has, moreover, given a considerable impulse to the iron industry, and the extension of subsidiary railway lines and tramways has not only resulted in large orders for rails, but also for bridge material, and while the home demand has thus been greatly increased, producers being able to take full advantage of the protection afforded by the import duties, the export trade in large girders and other ironwork has remained subject to the fluctuations of the international market and has derived no advantage from the activity of inland districts. The large orders given out on account of the State railways have exercised a most beneficial result on the wagon-building industries. Iron and steel works have orders on hand sufficient to keep them employed for a considerable length of time. The proprietors of rolling mills have strengthened their position by combining for the regulation of prices, while the large pig iron merchants have made business more difficult for manufacturers by combining under an agreement to restrict each dealer to supplying the large works within certain district limits, thus preventing competition. For years past the fact that German iron-masters supplied foreign buyers with railway materials at a lower price than they charged inland buyers has been a source of complaint which is now extending to other branches of the iron trade. Meanwhile, the machine works are busy and the ironmongery branches are also more active than for some time past; producers of small ironware, however, complain that owing to the high price of the material resulting from the combinations of large producers their trade yields no appreciable profits. The workmen are benefited by the general activity as they are more regularly employed and earn higher wages by working overtime, but there has yet been no increase of wages and no intimation of any advance. Large firms are making extra profits from the present position of affairs.

It would appear thus that the Government purchase of railways and the coalition of the great producers are the chief factors in the present prosperity of the Rhenish Westphalian iron industry, but the demand for home railways, it is thought, will be fully covered in a relatively short time. With considerable additions which are, meanwhile, being made to the producing capacity, it is feared that over-production will sooner or later again set in, resulting in a depression similar to that which has been experienced on different occasions.

Mr. Hiram Maxim, the indefatigable inventor, who has turned out more good things than we can now recall, and whose list of failures is remarkably small, has just brought out in France a system of fire protection in theaters which is certainly ingenious. It practically depends for its success upon the burning off of cords in various parts of the building which, when severed, allow weights to fall, valves to open, and streams of water are then distributed by pressure supplied by a tank. The system is a very complete one, and almost every point has been well considered, with two exceptions only. One of these is the danger of clogging the orifices by long continued dimse; and the other, that to wait until the cords are burned off is to unnecessarily delay applying water to the conflagration. If, instead of cords, wires connected by fusible metal links were substituted, the system would be vastly improved and the water could be distributed much sooner than is possible by any system of cords. It has been found by experience in this country that a series of water nozzles or sprinkler pipes which are not in constant use, or which do not have constant water pressure in them, are likely to become choked by the accumulations of rust, dust, and from a variety of similar causes, and thus to be inoperative at the very moment when prompt action is most necessary.

Messrs. John Brown & Co., of Sheffield, England, have recently completed a monster compound turret for H. M. S. Edinburgh. There are seven plates in the turret; one is 10 inches thick, with two port-holes 3 feet 11 inches by 2 feet 7 inches, and the other six are 14 inches thick. The diameter of the turret, outside measurement, is 28 feet 6 inches, the height 7 feet 2½ inches, and the weight, when finished, will be 152 tons.

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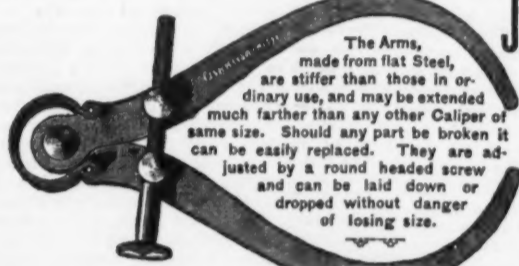


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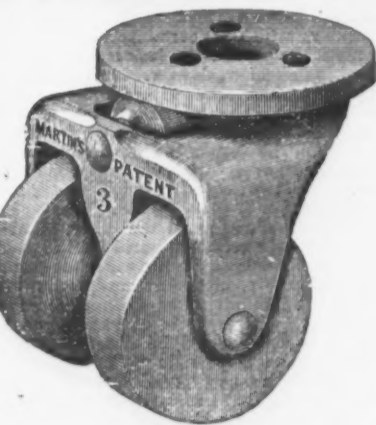
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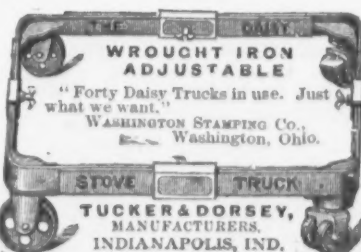
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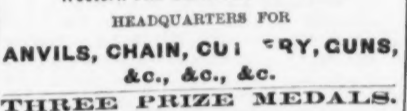
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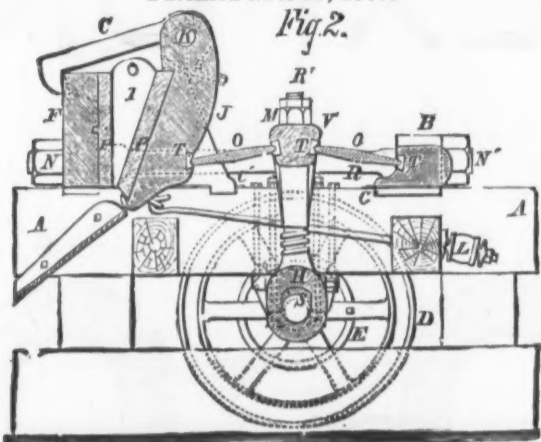
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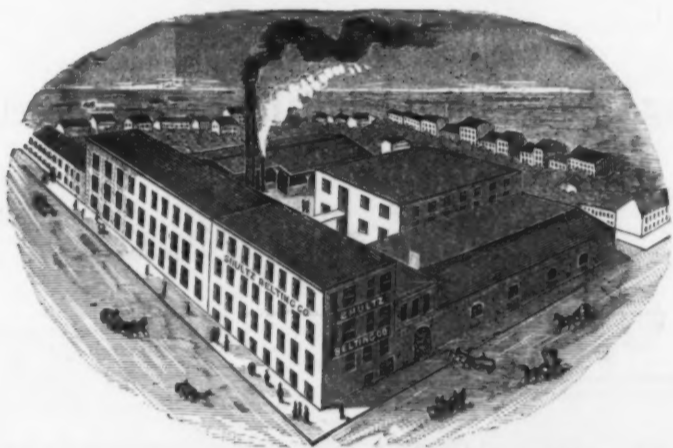
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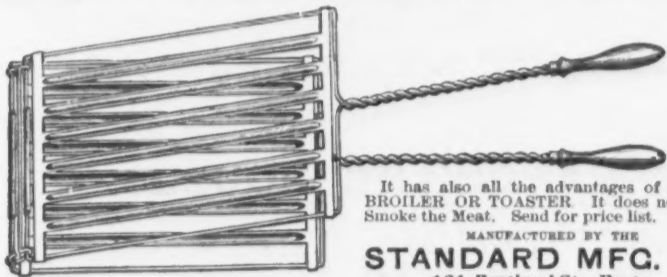
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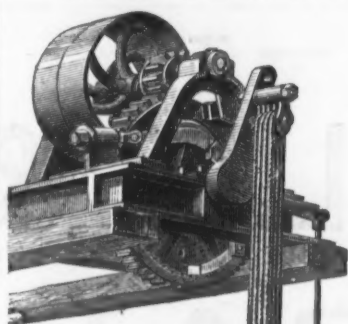
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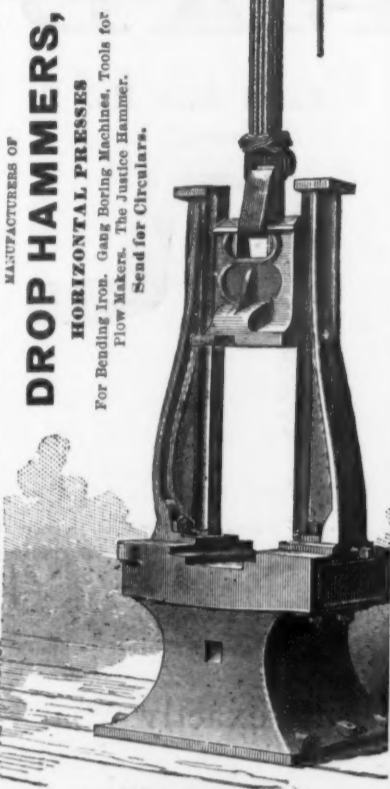


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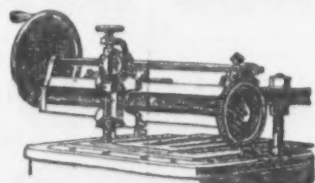
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Economy of Fuel, with increased capacity of steam power.

The same principle as the SIEMENS PROCESS OF MAKING STEEL; utilize the waste gases with hot air on top of the fire.

Will burn all kinds of Waste Fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, slack coal, &c.

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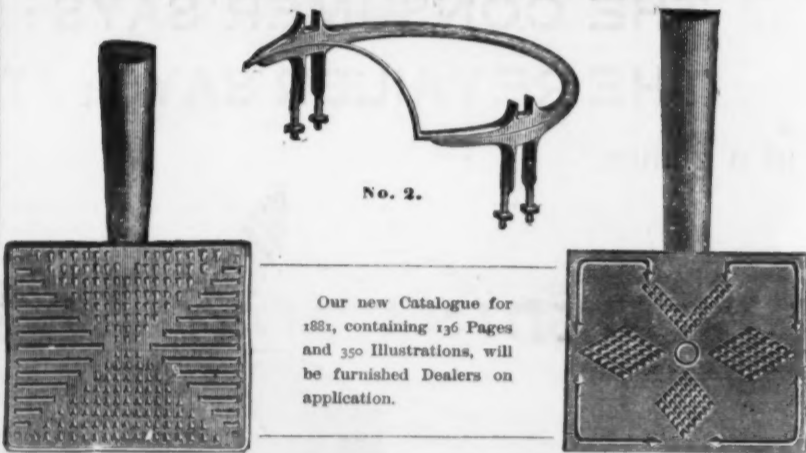
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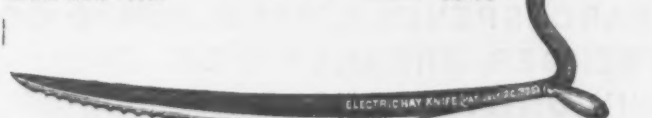


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1. We use nothing but best selected brands of new Lead and Pig Tin.
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**Tire Benders, Tuiere Irons, Revolving Clothes Irons, Barn Door Hangers, Barn Door Rail, Stay Rollers, Barrel Presses, &c.**

Would solicit articles to manufacture on contract or royalty. Send for catalogue.

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**JENKINS PATENT VALVES.**  
 GATE, GLOBE, ANGLE, CHECK AND SAFETY.

Manufactured of Best Steam Metal.

We claim the following advantages over all other Valves and Gauge Cocks now in use.

- 1.—A perfectly tight Valve under any and all pressures of steam, oils or gases.
- 2.—Sand or Grit of any kind will not injure the seat.
- 3.—You do not have to take them off to repair them.
- 4.—They can be repaired by any mechanic in a few minutes.
- 5.—The elasticity of the Disc allows it to adapt itself to an imperfect surface.

In Valves having ground or metal seats, should sand or grit get upon the seat it is impossible to make them tight except by regrinding, which is expensive if done by hand, and if done by machine soon wears out the valve, and in most cases they have to be disconnected from the pipes, often costing more than a new valve.

The Jenkins Disc used in these Valves is manufactured under our Patent and will stand 200 lbs. steam. Sample orders solicited. All Valves sold by us are warranted.

**JENKINS BROS.,**  
 71 John Street, New York. 101 Sudbury Street, Boston.

**The Humane Calf Weaner**

**The Perfect Hog Ring and Stock Mark.**

One instrument does for both purposes. The only Ring that insures the joint outside and makes a lock joint. The Humane Calf Weaner is as easy on a calf's head as a halter and as sure to stay. Samples and descriptive circulars furnished.

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**IMPORTANT TO MANUFACTURERS**

And all interested in a brilliant and economical light for heavy manufacturing establishments, such as rolling and Plate Mills, Foundries, Machine Shops, &c., &c. We call your attention to our improved

**VAPOR OIL TORCH LAMP,** the only reliable Torch ever put on the market, and is so pronounced by all who have tested these and other makes. We have reached this success after years of experimenting, and secured our first patent August 31, 1880, No. 235,671. Since then important improvements have been added, for which patents will be secured, for putting upon the market Vapor Oil Torches infringing our patents will be restrained by legal proceedings.

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**HOWLAND'S PATENT ROAD SCRAPER** will do the work of 30 men.

**IT IS EQUAL TO 15 REVOLVING SCRAPPERS,**  
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**THOMAS PARKES,**  
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 Of All Kinds.  
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### American Anthracite Blast Furnaces.

Among the many papers of interest read at the Vienna meeting of the British Iron and Steel Institute, was one on American anthracite blast furnaces, by Mr. John M. Hartman, of Philadelphia, who stated that the proportions generally used in recent anthracite practice are as follows: Crucible, 10 feet 8 inches; tuyeres, 9 feet from nose to nose; bosh, 18 feet; stock line, 17 feet; inner bell, 6 feet diameter; outer bell, 11 feet, distributing the stock on two rings, respectively 4 feet, and 14 feet diameter; cinder notch water-cooled, 3½ feet above the hearth; tuyeres, 6 feet above the hearth; bosh, 31 feet above the hearth; stock line, 70 feet, and total height, 75 feet. Volume of air blown, 18,000 feet per minute, of which 14,400 feet reach the furnace through seven tuyeres, 4½ inches diameter. Crucible walls, 24 inches thick; escaping gas from 180° to 300°, the average being about 250°; flue, 5 feet in the clear. The crucible is bound with a water-jacket from 18 inches below the hearth, to 9 feet above it. From this 9 feet to the mantel, the bosh is bound with a boiler-plate jacket ½ inch thick, and arranged to be cooled with water in the event of a scaffold. The columns of the furnace should extend 26 feet above the hearth.

Blast is supplied from a condensing engine capable of blowing 20 pounds to the inch, and having the proportion of the steam piston area to the blowing piston area as 2 to 3. The piston speed is 280 feet per minute. Iron-pipe stoves are generally used, giving about 850° of hot blast. Regenerative stoves are slowly coming into use, and are not run over 1200° up to the present time. The anthracite generally used in the Lehigh and adjacent districts, has a bright, shining fracture, a hardness of 2.5, and a specific gravity of 1.8. Analysis gives: Carbon, 88; volatile matter, 3.5; silica, 4.5; alumina, 2.6; sesquioxide of iron, 5; lime, 2; magnesia, 2; sulphur, 2. It is difficult to ignite, gives off carbonic oxide slowly, at a high heat is slightly pasty, and has a tendency to stick together. It burns on the surface only, and having no pores like coke, requires a much larger surface of contact to carburize a cubic foot of air per minute. Some qualities of it deteriorate and fill the furnace with fine cubes, requiring a high pressure and temperature to work it up. Trials made show that 4-inch cubes give better results than lump coal, which run about 10 inches each way. The 4-inch cubes give more surface of contact, and a purer coal is obtained, as the streaks of slate are better separated at the mine. The slate is high in silica, and requires extra coal and lime to flux it. While anthracite is difficult to ignite, it has the advantage of coke in not burning off so much at the top of the furnace, as in Bell's E tendency. Owing to its bright surface, it takes up heat slowly, and requires more time than coke to start combustion. The volatile matter in the coal helps combustion, and when a furnace is driven slowly, the volatile matter escapes before the coal reaches the tuyere, which makes it difficult to burn. The heaviest burden is carried and the best work done when the furnace is driven rapidly, which brings the coal to the tuyeres before losing too much volatile matter. Coal exposed to the air for some time carries less burden than that fresh from the mines.

The ores used are five-eighths limonite, containing iron 43 per cent., silica 18 per cent., alumina 2 per cent., water, &c., 15 per cent., and three-eighths magnetite, containing iron 54 per cent., silica 20 per cent., alumina 2 per cent., and lime 2 per cent., this representing the average. The flux is a highly magnesian limestone, quite variable, containing from 4 to 10 per cent. of silica, and gives a cinder of about the following composition: Silica, 36; lime, 30; magnesia, 20; alumina, 8; sulphide of calcium, variable. Average running gives:

	Tons, cwt. qrs.
Coal, per ton of iron	1 8 0
Ore	1 8 0
Stone	3 2 2
Iron Nos. 1 and 2, 600 tons best week's work.	4 6 0
Blast, 85°.	

In using regenerative stoves the coal is reduced to 1 ton 4 cwt., with a temperature of 1200°, and the output is increased 20 per cent. To start the furnace the charge is generally as follows: Wood, 8 cords; coal, 20 tons; limestone, 2½ tons; then follow six charges with coal, 4400 pounds; ore, 1500 pounds; stone, 700 pounds; cinder, 400 pounds. The charges are gradually increased and the cinder decreased, so that by the time the furnace is full the burden is—Coal, 4400 pounds; ore, 4800 pounds; and cinder, 0. Kiln-dried wood is preferable, and when it can be had, about 20 per cent. of coke is used for the first filling. The furnace is fired at all the tuyeres and allowed to burn 24 hours, or until the stock begins to drop. Blast is then turned on and the engine run at half speed, which gives about 2½ pounds pressure. The cinder will get to the tuyeres in about eight hours, when it is drawn off at the iron notch. The second and third flushes are drawn off there also, which gets the crucible clear of the mushy material in it, gives a clean crucible for the iron, causes the heat to strike down through the hearth, and avoids a hard tapping hole. With a good start the walls of the furnace will be saturated with heat in 10 days, when she can be worked up to her full capacity without detriment. Repeated trials show that 76 cubic feet of air per minute enter the furnace for each pound of carbon consumed, provided there is no Bell's E tendency at the top. Sulphur exists in variable quantities in the coal and magnetites, but is counteracted by the use of limestone. It lowers the grade of iron by closing the grain. When sulphur exists to any extent, rings of slag coal and sulphur are formed on the bosh, and prevent rapid driving, but when in time the heat works upward, this ring melts, runs out in the slag, giving it a strong odor, and producing a reddish brown coating on the slag. The difficulty of igniting anthracite allows the blast to work up through the burden farther than with coke, which, igniting at a lower temperature, seizes the air, and converts it instantly into carbonic oxide. The friction of the burden against the boshes causes the stock at that point to travel much more slowly than at the center of the furnace, which keeps the center more open and free to the blast than the sides. Slight rings or incipient scaffolds are continually forming

more or less on the bosh, which stops the flow of the burden lying against the walls. The sharp current going up the center fills the spaces between the burden against the wall with ore, coal dust, and lime, and helps to retain it there. The coal, ore and limestone remaining stationary on the walls are gradually disintegrated, and go to powder by the action of the heat. Drawing off the iron and cinder at casting, and then taking off the blast allows the coal to settle in the crucible, which disturbs this ring more or less. If the ring happens to be of some extent (especially with a furnace using fine ores), the dust rolls down through the coal and smothers the fire. This dust is composed of—

	Per cent.
Small coal from ¼-inch cubes to dust	46.0
Small ore from ½-inch cubes to dust	47.7
Small lime from ¼-inch cubes to dust	6.4

The ore exists as magnetic oxides, a little metallic iron, and some sulphurets. Some shots of iron and cinder are also found with the dust. A peculiarity of this dust is that the ore will agglutinate on cooling, but while it is red-hot it will roll and run like shot. On starting after casting, the stoves having cooled, the blast enters colder and blows the dust black, as the coal in the dust, being mixed with ore and lime, the particles of the coal are separated, and cannot assist each other in combustion. The dust also prevents the blast from getting at the large lumps of coal in the crucible. The blast pressure will then go up to 11 or 12 pounds, when, if the engine is not strong enough, the tuyeres must be pulled out, and dust with coal to the amount of 5 to 10 tons will be shoveled out. As the dust is removed the bright fresh coal follows down after it, and as soon as it appears at the tuyeres the tuyeres are replaced, the blast put on, and the pressure returns to its normal condition. On one occasion, when the dust had collected in a 20-foot bosh furnace the pressure was 10 pounds. The keeper first tapped off the cinder, then threw off the blast, and "botted" up the close front in 10 seconds; but, just as he threw the blast on, the burden slipped a little, the pressure fell to 4 pounds, the engine ran off, and the gas exploded in the furnace, lifting the bell and hopper, and throwing a large quantity of dust and part of the burden down the flue. After this the furnace ran well for some time. Attempts have been made to force the blast up through the dust to the fresh coal above it by blowing 20 pounds to the inch, and this course is generally successful. Where it failed, and the furnace was shoveled out, a hollow bag or pocket of fused stock was found around the nose of each tuyere. Where regenerative stoves are used, these dust troubles can be avoided by turning a very hot stove on the furnace after casting, and pricking the tuyeres well. A half volume of blast only should be used for a few minutes, until the tuyeres begin to glow. This smaller hotter volume of blast will kindle the fire and work up the walls, but must not be continued long enough to start the iron dripping down the walls, or the tuyeres will be destroyed. Repeating this at each casting the dust cannot accumulate enough to give trouble. When the rings get so firm that they scaffold the stock, a tuyere is put in under the ring, which, by the aid of hot blast, cuts the ring apart, leaving it to slide down to the tuyeres. If there is not coal enough below the ring, fresh coal must be put in through one of the tuyeres before the ring descends. Anthracite is hard, burns slowly, and gives a slow descent of the burden, which, with a sloping bosh, furnishes all the elements for a stubborn scaffold, which remains sometimes for 72 hours without moving. An anthracite furnace contains twice the weight of burden that a coke furnace of the same size does. The disintegrating action of a quick current of blast over anthracite is necessary to a certain extent to use it up rapidly and get the necessary penetration into the crucible. The nozzles must be properly proportioned to the volume of blast to get the proper distribution through the whole crucible. When the heat is properly concentrated at the tuyeres the furnace will do her best work, but to obtain and maintain this requires all the skill and care of a good founder. The difficulties now mentioned are liable to occur at any time, but by care and watching are generally avoided.

No. 1 iron is made with an exposure of 8 hours of the ore in a charcoal furnace and 12 hours in a coke furnace, in each case carrying a heavy burden. The great length of time of exposure heretofore in anthracite furnaces, from 48 to 72 hours, is not required. Forcing the furnace with 8 to 14 pounds of blast gives a better yield, and without deterioration of quality, although the furnace is more liable to slips of the burden. The results with regenerative stoves predicted by Cochrane of Dudley have been verified. Owing to the higher pressure of blast and the larger volume of gas required to regenerate steam, 1200° is about the practical limit of hot-blast on anthracite. In regular running the practice is to get the furnace hot and blow the maximum volume of blast the engines and stoves are calculated for, and if the furnace remains too hot, the burden is increased. The faster a furnace is driven the hotter she becomes and the more burden she carries. The heavier the burden, the less air is required, and the hotter the blast can be made with regenerative stoves. The flat boshes of the old charcoal practice, and the cone from the bosh to a small tunnel head, with some modifications, are generally used, but the laws of charcoal practice will not apply to anthracite. Charcoal will admit of flat boshes, as it is bulky, burns away quickly, and keeps the burden settling rapidly. There should be no slope or bosh above the fusion limits in an anthracite furnace. This will prevent the stock jamming on the slope above the fusion limit. The fusion limit of the 18 x 75-foot furnace given in this paper is at the top of the bosh. With the proper blowing machinery a furnace without a bosh would be the best, as instances have been found in which the bosh was entirely gone, yet the furnace was still doing good work. When the volume of blast is not sufficient the furnace gradually builds up on the boshes and works up through the center, but instances have occurred where the nozzles being too great the furnace worked up one side only for months. The distance across the center of the crucible from nose to nose of the tuyere is an impor-

tant matter, as on this diameter and the velocity of the entering blast will depend the even distribution of the latter.

When the tuyeres project too far, the blast works up the center; and if not far enough, the blast works up the walls. A decrease in the volume of blast for any considerable length of time must be met by a decrease in the size of the nozzles. The thick walls—usually 48 inches—of the hearth and bosh of the old charcoal practice are still retained, but the furnace will not drive until these are cut out, leaving about 12 inches thickness of walls, and leaving tuyeres exposed from 24 to 30 inches to the fire. Recently an 18-foot furnace, with a large hearth and thin walls well bound with a water-jacket, was put in blast, and it is now giving excellent results, yielding at the rate of 600 tons per week.

With the thick walls above the mantel and the limit of fusion above that point, the walls burn back, leaving a hump all around, on which the burden and the dust lodge, which increases the dust difficulty. The production of a furnace is dependent on the area of its crucible, and not on the diameter of the bosh. As the crucible walls are reduced, leaving only about 12 inches in thickness, the inner diameter of the crucible is virtually 24 inches less than the outside diameter of the brickwork, and it is the area of this inner diameter that governs the production.

A 20-foot bosh furnace having cut away the first course of her lining from the bosh up a certain distance, the whole inner course disappeared from the top, leaving the furnace apparently working on the second course. Some months after this the furnace was put out of blast, and on being cleaned out the furnace course was found to be telescoped on the bosh, cutting it off to 16 feet diameter, yet the furnace did as good work in every respect at 16 feet as on the 20-foot bosh. In order to secure the driving of a 20-foot bosh furnace, built with a 7-foot hearth, every means was tried, but the most that could be done was 350 tons per week. The hearth was then enlarged to 10 feet, which allowed more blast to be used, and without any other changes the product went up to nearly 600 tons.

Following the old charcoal practice, the lining from the bosh up tapers straight to a small top. As the top of a furnace is simply a hopper to hold stock during reduction, it is difficult to account for this taper, which reduces the stock capacity of the furnace and compels them to be built higher in order to give time for reduction. So long as the burden is well distributed the shape of the top is immaterial. A furnace 18 x 75 feet, with a wrought-iron shell 21 feet diameter at the top, is now and has been for some time running on the bare shell, there being no brickwork in the shell for 30 feet down; yet this furnace, with a 22-foot stock line and 18-foot bosh, on 43 per cent. silicious ores is doing excellent work, producing over 700 tons per week on the heaviest burden known. On blowing down 30 feet to find the brickwork the whole top became red-hot, and compelled them to fill up again to save the shell.

Heavy brackets are used at the top to give an independent support to the hopper and bell. Tests made in melting Swedish mail rods tend to show that anthracite cinder is hotter than coke cinder on the same grade of iron; the strong fluxing character of anthracite cinder, high in magnesia and low in alumina, would tend also to prove it. Coke cinder is low in magnesia and high in alumina, and is light fluxing, the alumina reacting when in excess. Noting the effect of heat on the grades, it appears that the highest heat produces an iron silvery in color, weak, without grain, and high in silicon. As the heat decreases less silicon combines with it, and the grain becomes larger and darker down to a certain temperature. From this point downwards the grain decreases with the temperature until white iron results. Additional limestone will hold the silicon in check by uniting with the silicon; but this is equivalent to lowering the heat, as the lime is a strong heat absorbent, and has the disadvantage of decreasing the yield. If all the coal of a light burden reached the crucible, silicified iron would result; but in a short time Bell's E tendency comes into play, and sends the surplus to the flues in the form of gas. A heavy burden and constant attention is the demand of the day.

No comparisons can be drawn between anthracite and coke workings until the specific heat of the cinders and iron are determined, and a full analysis of all material used is made. Anthracite practice is more difficult than coke practice, and honor is due to the Lehigh pioneer who has brought it to its present stage of perfection.

Cast-iron pipes are now being laid to receive the underground telegraph cable which, in a few months, will put Paris in direct communication with Marseilles. The work is being prosecuted from both ends along the right bank of the Rhone and following the main roads. The pipes are laid at a depth of more than 4 feet, and chambers for facilitating repairs are arranged about every 1600 feet. They are described as resembling large cast-iron cauldrons with covers, and having apertures for receiving the ends of the two pipes which they connect. At distances apart of about 325 feet, the pipes are united by cast-iron couplings, which will also permit of inspecting and repairing the cable, and the joint between each pipe is made with an india rubber washer or lead collar. The work is pushed forward with vigor, and it is proposed eventually to connect this cable, which will traverse France from N. to S., with the cables of the Mediterranean and Atlantic.

An extensive deposit of bismuth in the form of metal and oxide has been discovered in the northeast portion of New South Wales. The bismuth of commerce has hitherto been chiefly derived as a by-product in the treatment of zinc, cobalt and silver ores, and has commanded a price quite out of proportion to the cost of production. It is said that the metal from the new mine can be sent into the market at a cost which, if the present prices were maintained, would insure a profit of more than \$2500 per ton.

## Special Notices.

## For Sale.

**A Large Lot of Machinists' Tools, Pipe  
Machines, Engines and Boilers, &c.,**

Contents of the Girard Tube and Iron Company, in  
lots to suit purchasers, consisting in part of the fol-  
lowing:

- One 15 in. Cyl., 30 in. Stroke Engine, Corliss Pattern.
- One 14 in. Cyl., 30 in. Stroke Engine, Slide Valve.
- One 13 in. Cyl., 30 in. Stroke Engine, Slide Valve.

One 17 ft. x 16 in. Harrington Lathe.  
One 11 ft. x 7 in. Harrington Lathe.  
One 5 ft. 12 in. Cement Lathe.  
One 12 in. Compound Planer, N. Y. Engine Co.  
Six Pipe Cutting Machines.  
Three Pipe Testing Machines.  
One 22-in. Upright Drill. Sellers.  
Three Steam Pumps.  
One Stillwell Heater and Purifier.  
Two Vertical Nut Tappers, 3 spindles.  
Three Triple Cutting Machines.  
Three Cylinder Bolders, 30 in. by 30 ft.  
One 50-lb. Peck's Drop with Lifter, complete.  
One 40-lb. Double Beek Boller.  
One to H. P. Upright Boller.  
One to H. P. Locomotive Boller.

A large lot of turned Shafting from 1½ to 6 in. diameter, with Pulley and Hangers. Also several hundred feet of 5 and 6 in. cast iron heating pipe.

Pipe Mill with nine furnaces complete, including shafting, gearing, drawing chains, rolling beds, &c.

**HENRY T. SNELL,**  
135 North Third St., Philadelphia, Pa.  
**E. BISSELL & CO.**

## Wholesale Hardware Auctioneers.

Sales held weekly for the trade. Consignments solicited. We refer to the leading Manufacturers and importers.

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**ROBERT R. HAYDOCK & CO.,**

## AUCTIONEERS,

SOLICIT CONSIGNMENTS OF  
**HARDWARE, CUTLERY, &c.**  
**LEIGH'S**  
**DISCOUNT BOOK**

Specially arranged for the use of the

Acknowledged by ALL the best work of the kind  
ever published. Price by mail ONE DOLLAR.  
Address  
E. B. LEIGH, St. Louis Elevator, St. Louis, Mo.

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**FOR SALE OR TO RENT**

ON SALE OR TO RENT:

New, light Factory; 70,000 floor feet; 275 H. P. Corliss Engine, giving power at minimum cost.

Shafting, piping, elevator, &c., all complete and modern. Lowest insurance rates. Railroad siding and ample yard room. Immediate possession.

lon.

machinery at low prices.

**SHARPE RIFLE COMPANY,**  
Bridgeport, Conn.

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**Manufacturing Property for Sale.**  
The Real Estate of the late Foundry and Ma-

The Great Estate of the late Foundry and Machine Company of Taunton, Mass. Buildings consist of Foundry, Machine, Erecting and Blacksmith Shops, and covering about 60,000 square feet of ground. For particulars apply to  
**THE GEORGE PLACE MACHINERY AGENCY,**  
121 Chambers St. New York

## For Sale.

The Industrial Works of Shamokin, owned and successfully carried on for a number of years by the late Wm. Brown, deceased, consisting of Foundry and Machine Shop, with all the necessary

Shop, Blacksmith Shop and Factory for the manufacture of heavy coal screens. Well located in the borough of Shamokin, Pa., with the best facilities

tributing to the work that a shop of that kind  
possibly turn out. The works are now run-  
ing, but in a very short time possession can be  
even. Easy terms of payment are offered to suit  
purchaser of limited capital.  
Offered for sale by  
WM. McILVAIN & SONS,  
Reading, Pa.

**For Sale.**

The largest stock of New and Second hand Engines, Boilers, and general Machinery in the West. Send for Catalogue. Hoisting Outfits for Coal Mining and other purposes a specialty.

**WARREN SPRINGER,**  
195 to 219 South Canal St., Chicago.

### For Sale.

WHEEL,  
feet 4 inches diameter, 2 feet 6 inches face,  
red for 6½ inch shafting. Will be sold cheap.  
AKRON RUBBER WORKS,  
Akron, Ohio.

### For Sale.

o-Horse-Power Tubular Boiler, second hand, in  
t-class order. Also, a Lambertville 40 Horse-

Water Engine Used for six months, and one 40-Horse-Power Locomotive Boiler.

144 N. 3d St., Philadelphia, Pa.

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**For Sale.**

**COPPER WORMS**  
in good order for brewery purposes.  
SITES & GILL,

WANTED.—A situation as Traveling Agent

Have had number of years' experience and  
give A1 references.  
address, J. S. L.,  
Box 471, Elmwood Ave., S. E. 4th St., S. W.,  
Cleveland, Ohio 44115

MANUFACTURERS OF HARIWARE OR

Address  
**MANUFACTURERS' AGENT,**  
Office of The Iron Age, 80 Beede St. New York

## Special Notices. For Sale.

### Palo Alto Rolling Mills, Near Pottsville, Pa., ON THE MAIN LINE OF THE POTTSVILLE AND READING RAILROAD.

These mills are in good repair, and can be started in two days' time.  
Rolls for T-bar, 18 to 20 lbs. per yard, and for Street Rails 18 to 20 lbs. per yard.  
Guide Mill Train for Merchant Iron 1/4 to 1 inch.  
Rolls for Merchant Bar, round and square, up to 4 1/2 inches.  
Number of Puddling Furnaces in both mills, 30; Heating Furnaces, 9; all with boilers attached.  
Also Foundry, Machine Shop, Blacksmith Shops, Iron House, Roll House, Carpenter and Pattern Shops, Stables, handsome Dwelling for Superintendent, 11 Tenement Houses, a Brick Office, and ample grounds for stock and cinder.  
For further particulars address  
Messrs. LEE & McCAMANT, Exrs.,  
Pottsville, Pa.

THOS. F. WRIGHT, 1804 Race St., Philadelphia, Pa.  
HUGH W. ADAMS, 56 Pine St., New York.

### Furnace Property For Sale.

Will be sold at a low price. The Charter, Rights and Real Estate of the Bloomington Iron Co., together with such portions of the stock of materials and other personal property as purchasers may require. The real estate consists of two blast furnaces favorably known as the Ironclad Furnaces, in good condition, steam engine, water power of 100 to 200 horsepower, lands with extensive iron mines, storehouse, numerous dwelling houses, R. R. tracks and sidings several miles in length (connecting the furnaces with both Canal and Railroad), canal wharves with tracks and facilities for receiving and shipping large quantities of freight with economy and dispatch, either by canal or railroad.

This property is situated at Bloomington, Pa., within 30 miles of the Wyoming Coal field.  
The furnaces have been in continuous and successful use for 37 years. The Company own in addition extensive and valuable ore mines in Snyder Co., Pa.

All the property is in good order and now in profitable use. For further information apply to  
CHAS. R. PAXTON, President,  
Bloomington, Pa.

### For Sale or Lease.

A Large Two-Story Brick Factory,  
formerly Machine Works, at Pearl River, N. Y., on railroad depot, 25 miles from New York City. Railroad facilities unexceptionable on the line of the New Jersey and New York Railroad. The property contains 40,000 square feet floor space, with one 80 H. P. Engine and Boiler, 700 ft. 2-inch line shafting and pulleys, main belts, steam heating and water pipes throughout the building. A splendid iron foundry, 70 ft. by 90 ft., with one iron smelting cupola with Mackenzie blower, brass furnace, core oven, blacksmith shop, pattern vault, annealing oven, etc. The property can be bought or leased on liberal terms. For further particulars, price, terms, etc., address  
J. E. & CO.,  
112 Liberty St., New York City,  
Or Pearl River, Rockland Co., N. Y.

### For Sale.

### BOLT HEADERS.

One Burdick Header.  
One Improved Lewis, Oliver & Phillips style.  
Two Chapin Headers.  
Five National Headers.  
National Hot-Pressed Nut Machine.  
And complete outfits for Bolt and Nut manufacture. Apply  
NATIONAL MACHINERY CO.,  
Cleveland, Ohio.

Specialists in this line of machinery.

### For Sale.

4 Noiseless Vertical Engines, 8 x 8 Cylinder, New.  
1 H. P. Vertical Tubular Boiler; cast-iron base plate; all complete; in good order. Second Hand.  
F. B. BANNAN,  
STEAM HEATING AND BRASS WORKING,  
Pottsville, Schuylkill Co., Pa.

### FOR SALE.

One Horizontal Engine, 35 in. x 48 in.  
One Horizontal Engine, 24 in. x 60 in.  
One Horizontal Engine, 24 in. x 36 in.  
One "Corliss" Horizontal Engine, 24 in. x 48 in.  
Two Horizontal Engines, 30 in. x 60 in.  
Two Horizontal Engines, 24 in. x 36 in.  
Two Link-motion Engines, 18 in. x 20 in.  
One Upright Engine, 28 in. x 30 in.  
Housings, Pistons and Bed Plate suitable for 18 in. train.  
JOHN C. HASKELL,  
261 and 262 Water Street.

### Corliss Engines For Sale.

PROMPT DELIVERY.  
One—12-inch cylinder, 36-inch stroke, at once.  
One—14-inch cylinder, 36-inch stroke, in two weeks.  
Apply to  
THE GEORGE PLACE MACHINERY CO.,  
121 Chambers and 103 Reade St., New York.

### For Sale.

Second-hand  
**DROPS AND LIFTERS.**  
BECHER & PECK,  
Lock Box 122, New Haven, Conn.

### For Sale.

Horizontal Engines, 16 x 42 (Hewes & Phillips), with cut-off; 18 x 36 (Currier), with cut-off; one 80 H. P. Locomotive Boiler; one 4-ton "Otis" Freight Elevator; one 50 H. P. Horizontal Tubular Boiler. All the above guaranteed complete and in perfect order.  
For particulars address  
BECHER & BAGNALL,  
40 Cortlandt St., N. Y.

### The Sherman Process Co.

9 Pemberton Square, Boston, Mass.,  
Issue Licenses to use the Process for the  
Manufacture of Iron and Steel  
In the Bessemer Converter, Crucible, Siemens  
Martin, Puddling, Blast and Cupola Furnaces.  
The use of this Process improves the quality of the product, saves fuel and labor, and does not require any change in furnace or manner of working.  
See page 17 of The Iron Age of Oct. 25th, 1877.

## Trade Report.

### BRITISH IRON AND METAL MARKETS.

[Special Cable Dispatch to The Iron Age.]

LONDON, WEDNESDAY, Oct. 4, 1882.

Scotch Pig.—The market is active with a large demand, and quotations are higher. Business during the week has been large. The following are to-day's quotations for makers' brands:

Langloan, alongside, Glasgow	68/
Coltness " "	70/ 72/6
Jarvis " "	66/
Summerlee " "	65/6
Carnbroe " "	59/
Glengarnock " Ardrossan	59/
Eglinton " "	54/
Lighterage from Ardrossan to Glasgow is 4/ 4/6 per ton.	

Cleveland Pig.—The demand continues large and prices are firmer, with a prospect of higher figures. The market is active with a large demand, and quotations are higher. Business during the week has been large. The following are to-day's quotations for makers' brands:

Middlesboro' No. 1 Foundry	48/6
" No. 2 " "	47/
" No. 3 " "	45/
" No. 4 Forge	43/6

Bessemer Pig.—Business continues good under a steady demand. Prices are easier. W. C. Hematites, mixtures equal portions Nos. 1, 2 and 3, are quoted 56/ @ 57/6 f. o. b. shipping ports.

Blooms.—A fair business is doing and prices are firmer. Bessemer, 7" x 7" are quoted 54. 17/6 @ 55.

Manufactured Iron.—The market is active, with improving demand, and a large business has been done during the week. Prices tend upward. We quote as follows, at works:

Staff. Ord. Marked Bars	7 0 0 7 10 0
" Medium " "	7 0 0 7 10 0
" Common " "	6 0 0 6 10 0

Hoops, 20 W. G. and over.  
" Common Best..... 8 0 0 8 10 0  
" Medium..... 7 0 0 7 10 0  
" Common..... 6 10 0 6 13 0

Sheets, 20 W. G. & under.  
" Ordinary Best..... 9 10 0 11 0 0  
" Common..... 8 10 0 9 0 0  
Welsh Bars..... 5 15 0 6 0 0

Steel Rails.—The market continues dull and prices weak. Ordinary Sections are quoted, 55. 7/6 @ 55. 17/6, f. o. b. shipping ports.

Iron Rails.—Welsh are, nominally, 54. 17/6 @ 55.

Old Rails.—The market is quiet, with but few offerings and small sales. Prices are firm. Old Tees are quoted, 53. 17/6 @ 54. 2/6, and Old D. H's., 54. 5/ @ 54. 7/6, all c. i. f. New York.

Scrap.—There is but little business doing. Heavy Wrought is quoted, 53. 12/6 @ 53. 15/6, c. i. f. New York. Bessemer Scrap Ends, run of the mill, are quoted, 65/ @ 67/6.

Copper.—The market continues active with good demand, and prices have further advanced, to-day's quotations being: For Best Selected, 57. 10/ @ 57. 10/6, and Chili Bars, 57. 10/ @ 57. 2/6.

Tin.—The market is quiet, and prices are a shade lower than last Wednesday. Straits Tin, spot, is quoted at 1106. 10/ @ 1107, and Futures, 1107 @ 1107. 15/.

Tin Plates.—The market is active, with an improved demand, and a large business has been done. Prices tend upward; we advance quotation for Charcoal 1/ 1/2 box. We quote:

Tin Plates, 10 x 14, 1st qual. Charcoal	22/ @ 24/
" " " " " "	20/ @ 21/
" " " " " "	18/ @ 19/6
" " " " " "	16/6 @ 17/

Spelter.—There is no change to report, the market ruling quiet and prices steady. Ordinary is quoted 517 @ 517. 2/6 @ shipping ports.

Lead.—The market is quiet and unchanged. Common English Pig is quoted 514. 5/ @ 514. 7/6.

Freights.—Steam from Glasgow to New York, 12/6; ditto from Liverpool to New York, 12/; Liverpool to Philadelphia, 13/.

### FINANCIAL.

Office of THE IRON AGE,  
WEDNESDAY EVENING, October 4, 1882.

Monetary stringency in the stock market, strengthened by the artifices of professional speculators, has led to a continued shrinkage of values, notwithstanding Secretary Folger's intended measures of relief. The opportunity has been availed of, however, to purchase stocks and other securities largely on foreign account. In some quarters importations of gold are looked for at an early date, but upon this point opinions are widely at variance. The mercantile situation remains unchanged, there being a good fair trade in progress throughout the country, and the general feeling is one of hopefulness and confidence. Crop reports are favorable; railroad traffic is heavy, on a remunerative basis; exchange is low, with a still downward tendency, and the monetary situation affords no ground for uneasiness.

The testimony of our mercantile agencies, gathered from numerous sources, agrees in representing the trade of the country as in a prosperous condition, though calling for the

exercise of a wise conservatism, especially in mercantile credits. The activity in the distribution of merchandise which immediately followed the first assurance of abundant crops, gathers new force now that a good cotton crop has matured, and grain, for the most part, is beyond the contingency of frost.

Money during the week has been active, chiefly through the agency of speculative cliques. While Secretary Folger's action in anticipating the payment of bonds afforded momentary relief, the stringency complained of in the street was scarcely perceptible. It is now intimated that, should money again be forced up to exorbitant rates, the Secretary will authorize the purchase of a liberal amount of bonds each week for the sinking fund, in addition to the regular call. In mercantile paper, the best names, indorsed, are offered at 7%, with occasional sales.

On the Stock Exchange during the week under review the market has been unsettled by a variety of causes. On Thursday and Friday there were organized raids on Louisville and Nashville, Central New Jersey and Denver. On the other hand, the decline in foreign exchange had a stimulating effect, it being apparent that considerable purchases of stocks were making on foreign account, principally Trunk lines, Union Pacific, Lake Shore and Illinois Central. The rumored embarrassment of Louisville and Nashville was a source of uneasiness until the close of the week, and was made the occasion of repeated attacks on various properties by board-room bears. On Monday, despite the feverishness prevailing, a very large business was done, most of it at declining prices. Money ruled anywhere between 7% and the exceptional rate of 20%.

On Tuesday bear raids were renewed, Louisville and Nashville being the chief object of attack. To-day a Louisville dispatch was received, stating that at the regular annual meeting of the company it was decided to increase the share capital to \$30,000,000, or about \$12,000,000.

The price of the stock on the receipt of this news fell below 56, and was the signal for a general selling movement in all the active speculators, but in the later dealings the general list partially recovered and was strong at the close. The leading stocks to-day ranged as follows: Louisville and Nashville, 59 @ 56; Union Pacific, 108 @ 106 1/4; Texas and Pacific, 45 1/2 @ 46 1/4; Western Union Telegraph, 87 1/2 @ 88 1/4; Lake Shore, 112 1/2 @ 113; Kansas and Texas, 36 1/2 @ 37 1/4; Erie, 42 1/2 @ 42 1/4; Denver, 56 1/2 @ 58 1/4; Delaware, Lackawanna and Western, 138 1/2 @ 139; ditto ex div., 136 1/4 @ 136 1/4; Missouri Pacific, 106 1/2 @ 108; Michigan Central, 97 @ 98 1/4; Jersey Central, 74 1/2 @ 75 1/4; Milwaukee and St. Paul, 108 1/2 @ 109 1/4; St. Paul and Omaha, 51 1/2 @ 52 1/4; and Northern Pacific preferred, 95 @ 95 1/4.

Foreign exchange has fallen during the week to very near the gold-importing point, and to-day is barely steady at the recent decline. The posted rates for prime bankers' sterling are 4.81 1/2 and 4.86 @ 4.86 1/2. The actual rates are 4.80 1/2 @ 4.81 and 4.85 @ 4.85 1/2. It is explained that the exchange made in the payment for the Panama Railroad and by bankers to secure the higher rates here for money have temporarily overstocked the market.

The mercantile failures in the United States for the last quarter are 155 in excess of the record for the previous quarter, but 488 below the number of the first quarter of this year. The number of failures for each of the three quarters for the two years, as given by Bradstreet's, were as follows:

	First quarter.	Second quarter.	Third quarter.
1881.....	1,986	1,270	1,131
1882.....	2,146	1,593	1,658

The increase in each quarter compared with 1881 is striking, but is attributed to nothing more than ordinary causes operating through a country constantly extending. The liabilities, on the other hand, are considerably less for the last quarter, taking the country as a whole, than for the previous quarter. The heaviest failures are mostly in the Middle and Eastern States. Five failures in New York City aggregate about \$3,260,000 in liabilities, or about 4 per cent. of the liabilities for the Middle States, and about 20 per cent. of the liabilities for the entire country.

In breadstuffs within the last day or two the market has a stronger look, attributable to a reaction from "the large crop scare" in which the market was oversold. Foreign values are kept down by large stocks in hand and expected heavy arrivals. Moreover, according to the latest authenticated reports, the European wheat crop is above the average. Exporters are buying less freely, partly on account of restricted freight room. For lard and pork the export demand is light.

The report of the Clearing House Association, presented at its annual meeting, showed that the transactions for the year were \$48,147,846,406.61, an average of \$150,833,375.92 per day. The total amount of gold coin used in settlement of balances since resumption, three years and nine months, has been \$971,967,000. The largest transactions for any one day during the past year were \$240,799,252.84, on the 3d of January, 1882.

The following is an analysis of the bank totals of this week compared with that of last week:

	Sept. 23.	Sept. 30.	Comparisons.
Loans.....	\$325,688,600	\$319,397,600	Dec. \$6,291,000
Specie.....	51,018,500	48,442,000	Dec. 2,576,500
Legal t'd's	21,057,800	21,648,800	Inc. 591,000
Tot. reserve	72,075,900	70,060,800	Dec. 2,005,700
Deposits.....	297,388,300	288,628,900	Dec. 8,760,400
Reserve re-quired.....	74,347,335	72,157,225	Dec. 2,190,100
Surplus.....	2,271,825	2,027,425	Dec. 244,400
Circulation.....	18,637,400	18,759,800	Inc. 122,400

The bank return for the week shows a gain of \$184,400 in reserve, which now stands at \$2,087,425 below, against \$2,746,825 below at this time last year, and \$4,399,750 above for the corresponding date in 1880.

The importations of specie and bullion at this port during the week ending September 29 were \$399,532, consisting of \$315,580 in gold, and \$83,952 in silver, as against a total of \$1,051,528 for the week ending Oct. 1 last year. The importations since the 1st of January and since the 1st of August compare as follows with the movement during the corresponding periods last year:

	Since January 1—1882.	1881.
Gold.....	\$1,087,353	\$44,275,131
Silver.....	2,025,368	2,181,640
Total.....	\$3,092,721	\$46,458,771

	Since August 1—1882.	1881.
Gold.....	\$444,842	\$15,631,092
Silver.....	542,650	409,422
Total.....	\$987,492	\$16,040,514

Government bonds have been irregular, but to-day were firm throughout, closing as follows:

	Bid.	Asked.
U. S. 6's, '81, continued at 1/4	—	100 1/4
U. S. 5's, '81, continued at 3/4	—	112 1/2
U. S. 4 1/2's 1891 registered	112 1/2	112 1/2
U. S. 4 1/2's 1891 coupon	112 1/2	112 1/2
U. S. 4's 1897 registered	112 1/2	112 1/2
U. S. 4's 1897 coupon	112 1/2	112 1/2
U. S. Currency 68 1895	110	—
U. S. Currency 68 1896	110	—
U. S. Currency 68 1897	110	—
U. S. Currency 68 1898	110	—
U. S. Currency 68 1899	110	—

In State bonds, Tennessee compromise declined to 60, and Louisiana consols to 70.

### MINING STOCKS.

The closing quotations for Mining Stocks were as follows:

	Bid.	Asked.
Amie.....	15	—
Alice.....	1.75	—
Bechtel.....	20	—
Belle Isle.....	44	—
Bodie.....	4.50	—
Buller.....	1.00	—
Bull Dom.....	3	—
Bradshaw.....	33	—
Calaveras.....	2.00	—
Cale B. H.....	1.65	—
Consolidated Virginia.....	1.00	—
Chrysolite.....	1.65	—
Carbon.....	1.40	—
Durango.....	9	—
Deatur.....	78	—
Eureka C.....	14 1/2	—
F. De Smet.....	5	—
Great Eastern.....	3	—
Green Mountain.....	90	—
Gold Strike.....	20	—
Hall And.....	1.75	—
Hull.....	15	—
Iron Silver.....	8 1/2	—
Hibernia.....	5	—
Hortense.....	14	—
Independence.....	1.30	—
Iron Silver.....	2.10	—
Lacrosse.....	14	—
Leadville Con.....	70	—
Little Pitts.....	1.00	—
L. Chief.....	54	—
Mexican.....	5 1/2	—
Moose.....	11	—
North Star.....	30	—
N. Y. & Col.....	13 1/2	—
S. Belle Isle.....	30	—
Ori. and Mil.....	13	—
Rappah'k.....	10	—
Robinson Con.....	1.55	—
Sierra Nev.....	1.60	—
Standard.....	5 1/2	—
S. Cliff.....	89	—
Sutro.....	28	—
Stromont.....	40	—
S. Hite, now.....	37	—
South Pacific.....	13	—
St. L. 1 and 4.....	5	—
St. L. 2 and 3.....	16	—
Tin Top.....	2.00	—
Trojan.....	9	—
Tuscarora.....	25	—
Union Con.....	5 1/2	—
Utah.....	5	—
Vizina.....	1.35	—
B. H. & E. B.....	1.00	2.1-16

### GENERAL HARDWARE.

It is generally conceded that business is quiet for this season of the year. The orders coming forward are numerous, but they are said to be chiefly of a sorting-up character. The tone of the market continues strong, and prices, with few exceptions, are firm. The demand for foreign hardware is light, but values are steady and unchanged.

The termination of the strike among the nail makers of Wheeling and Pittsburgh has had the natural effect of curtailing the inquiry from the West and South. The demand here on local and near-by account continues active, and a large business is transpiring at full figures. Assortments, as previously noticed, are badly demoralized, and some of the most desirable sizes are hard to find, and when found command a premium over the card rate. We quote rod. to 60d. \$3.75 net per keg.

We print below a circular of New London Scythe Co., in regard to the "Electric" Hay Knife, which they are manufacturing under Kellogg's patent. Horace F. Sise, their agent in this city quotes these goods as follows:

	Per doz.
Iron Back, Steel Edge.....	\$15.00
Solid Cast Steel.....	18.00

These prices are net, but for large orders a discount is allowed. In an advertisement on page 22 an illustration of this Hay Knife will be found, to which we invite attention.

NEW LONDON, N. H., October, 1882.

GENTLEMEN: We have lately purchased Kellogg's patent of the "Electric" Hay Knife. We have made a knife with iron back and steel edge, under this patent, for other parties for some years past, but shall assume all sale of it in future. We have now ready for the market a new solid steel Hay Knife, also under this patent, which we can particularly recommend for great strength and the ease (as with the Knives made heretofore) with which it is sharpened. A half-round file used on the teeth, and grinding the flat side on a common scythe stone, gives them a perfect edge. Owing to the shape of the teeth, these Hay Knives cut both in pushing and pulling. The quality is guaranteed to be equal to our celebrated Scythes in all respects.

We have also arranged with Russell Mor-

gan for the control of his Genuine Morgan, Dutch Bow and Brinzer Pattern Grain Cradles, and shall endeavor to furnish for this implement a Scythe even superior to any we have ever made. As these Cradles are hand-made, the number produced will be limited, and we suggest that orders be given as early as possible. Cradles will be shipped from Fayetteville, N. Y.; Scythes and other goods from New London.

Very respectfully,  
NEW LONDON SCYTHE CO.,  
(HORACE F. SISE, Agent)  
100 Chambers St., New York.

Phipps & Barman, Birmingham, England, patentees and manufacturers of Reversible, Self-Sharpening and other improved Clipping Machines for horsemen and barbers, through their United States sole agent, Jesse Lee, 37 South Fourth street, Philadelphia, invite the attention of the trade to the several new styles added to their already well-known list of Machines. Clippers of the above make are supplied with two sets of teeth

## IRON.

**American Pig.**—There is very little new business to report this week, and the market presents a quiet but firm aspect. The deliveries on old contracts continue to be heavy, and we do not hear of any pressure to sell. We repeat former quotations, viz.: Foundry No. 1 X, \$26 @ \$27; Foundry No. 2 X, \$24 @ \$24.50; Gray Forge, \$22.

**Scotch Pig.**—Business is generally reported quiet, although sales in lots during the week will aggregate fully 1000 tons, and for which full figures were obtained. The tone of the market is strong and prices tend upward. We quote: Eglinton, \$23 @ \$24; Carnbroe and Glengarnock, \$25.50 @ \$26; Coltness, \$27.50 @ \$28; Gartsherrie, \$26, and Langloan, \$26.50 @ \$27.

**Rails.**—Although rumors are current of large transactions in Steel Rails during the week, we cannot verify them. Some small lots sold here within a few days are said to have been taken at a shade under our minimum quotation, which leads to the inference that the competition for business is growing keen. We quote Steel at mill \$43 @ \$46. Iron Rails are neglected and prices nominal.

**Old Rails.**—The demand for Old Rails is light, and no transaction worthy of mention has come to our notice since we last went to press. We quote: Tees, \$27 @ \$28, and D. H., \$30 @ \$31.

**Wrought Scrap.**—Prime Yard Scrap is quoted \$30 @ \$31 ton, and ex ship lots, \$28.50 @ \$29. Business dull.

The Iron and Metal Exchange Co., Limited, No. 69 Wall street, have made their Change hour 1 to 2 p. m., instead of 12 to 1 p. m., as formerly. We have received from the secretary a copy of arbitration rules recently adopted, which we print below.

## ARBITRATION RULES.

I. The Board shall appoint, from among the associates of the Exchange, an Arbitration Committee of three persons not directors. A new Arbitration Committee shall be then appointed for each month, and the names of those composing the committee shall be posted on the Exchange Bulletin. Any vacancy on the Arbitration Committee may be filled by the two remaining members.

II. Any question in dispute between persons entitled to the privileges of associate membership may be referred to the arbitrators on the following conditions: The persons desiring an arbitration must make application in writing to the secretary, stating the nature of the case to be submitted, and the point or points on which they desire a decision, and that they agree to be bound finally and without appeal by the decision of the arbitrators, and will pay the costs of the arbitration as prescribed by these rules.

III. The persons desiring an arbitration may, if they prefer, each name an arbitrator, who shall be an associate of the Exchange, and the two thus named shall select the third arbitrator from the Arbitration Committee appointed by the Board of Directors.

IV. A decision supported by two arbitrators shall be binding, but no arbitration shall be valid unless all three arbitrators are present at all hearings.

V. The secretary of the Exchange shall be the secretary of the Arbitration Committee, and shall keep the record of its proceedings in a special book.

VI. Arbitrators shall each be entitled to a compensation of \$5 for every arbitration, and the secretary shall be entitled to the same compensation.

VII. The expense of the arbitration shall be borne by the party against whom a decision is rendered, unless the arbitrators shall agree on a proportion in which the expense shall be divided between the parties to the arbitration.

Arbitration Committee for October, 1882.

DAVID THOMSON,  
A. W. HUMPHREYS,  
GEORGE W. JONES.

## METALS.

**Copper.**—Sales for the week have not exceeded 100,000 pounds Lake Superior, at 18¢ @ 18½¢, the market closing, though quiet, with a rather firmer feeling at 18¢ @ 18½¢, Lake; 17½¢, nominally, Baltimore and 17½¢ "Anchor" brand. The advance in London the past few days to 27¢, best selected, and 27¢ Chili Bars, seems to be due on the one hand to the favorable statistical position on the other side, and next to the reviving demand for manufactures for British India, now that the collapse of the Egyptian rebellion has permanently restored the transit, uninterrupted, through the Suez Canal. Everything seems to favor Copper on the other side. But so far as export chances from here to Europe are concerned, it should be remembered that the parity of 27¢ in London is 10¢ here; consequently quite a considerable further improvement would have to take place on the other side ere any export hence at about ruling figures can be thought of. But however this may be, the European advance does not fail to spread a more confident feeling among us, and thus counteracts to a degree the, for the moment still cheerless, financial aspect which confronts us at New York. We receive from London to-day the ensuing cable dispatch direct: "Market continues active, with good demand, and prices have further advanced, to-day's quotations being for Best Selected, 27¢ 10/100 @ 27 1/2; Chili Bars, 27 1/2 @ 27 1/2." By mail we have the following: "London, Sept. 23.—The state of this market continues sound and satisfactory, and a very fair amount of business has been transacted. Prices have continued to harden day by day for Chili Bars, and sellers seem more and more indisposed to make sales at current rates. There is a general idea prevailing that prices must shortly further advance, and the better rates now quoted appear to arise from an improved position of the actual state of the market." Manufacturers have made no change in prices. They quote: Bottoms, 31¢ @ 32¢; Brainers, 30¢ @ 30¢; Circles, 33¢ @ 36¢; Sheathing, 28¢,

and Bolt Copper, 30¢; Segment Sheets, 33¢; Fire-box ditto, 30¢.

**Tin.**—Arrivals being now more copious, the wholesale market in Tin gets to be more and more demoralized, tending rapidly downward, we trust to a figure low enough to encourage the consumer to once more take hold of this metal without a continual dread. The advance in London has not been sustained; this morning Straits dropped to £107. This afternoon we receive from there the following news: "Market quiet and prices a shade lower than last Wednesday. Straits Tin, spot, £106. 10/ @ £107; and futures, £107 @ £107. 15/." September shipments from the Straits to the United States have been 620 tons; to England, 250; and to the latter country, from Australia, 900. Meanwhile the London deliveries in September have been 1400 tons, against 550 tons simultaneous arrivals here. Mr. Charles Nordhaus, 17 Cedar street, puts on record for the month of September last the movement below:

Sept. 1.—Stock in the United States	Tons.
September arrivals	1,300
Total	2,500
Consumption	1,000
October 1.—Stock	1,500
Adopt	2,600
Visible supply, October 1	4,400

This is about as unfavorable a statistical position as we have had on this coast for a long time past. Messrs. William I. Russell & Co., 12 Cliff street, New York, in their circular of October 1, quote the price of Straits 25¼¢, against last year, same time, 21¼¢; 19¼¢ in 1880; 18¼¢ in 1879, and 13¼¢ in 1878. "London, Sept. 23.—Again we have to report an extensive business in this metal, and prices for foreign, after having remained fairly steady for some little time at about £106. 10/ have again taken a strong upward turn, and have been further improved to the extent of some 20/ or 30/ per ton. Prices are still chiefly enhanced by the action of speculators, but those features which induce them to continue to effect further contracts, and to make the turnover of this metal far greater than the actual stock must not be overlooked." We quote at the close, large lines, Straits, 24¼¢ @ 25¢, and Lamb and Flag, 24¼¢ @ 24½¢. Tin Plates.—A fair jobbing trade has prevailed, but it runs more particularly on Charcoal Tin, so that our quotation for Cokes might, perhaps, be slightly shaded. We quote toward the close, large lots, ordinary brands, 2¢ box: Charcoal Bright, 26.25 @ 26.50; ditto Ternes, \$5.37½ @ \$5.50; Cokes Tin, \$5.25 @ \$5.35; and ditto Ternes, \$5 @ \$5.25. From Liverpool Cokes came yesterday, 16/6, and Charcoal, 19/ @ 20/6, and to-day we are advised as follows: "Market active, with an improved demand, and a large business has been done. Prices tend upward, Charcoals having advanced 1/ per box."

**Lead.**—There has been rather less doing on account of the extremely high price demanded in its concentrated position, constantly undersold at lower prices, so that most buyers hold back, and little transpires beyond a mere jobbing business. Some 300 tons Common Domestic sold in this manner, in lots, at \$5.15 @ \$5.25, while of Refined nothing changed hands, and we call the same, nominally, \$5.20. St. Louis quotes Hard and Soft, indiscriminately, 4½¢, with 3¢ freight this way. From Europe we receive the following cable message to-day: "Market quiet and unchanged. Common English Pig, £14. 5/ @ £14. 7/." By mail we are advised as under: "London, Sept. 23.—Lead is dull, and business has been done in Spanish at £13. 17/6 and even lower. We quote Spanish at £13. 15/ @ £14, and English at £14. 2/6 @ £14. 5/." There is no change in manufactures. We quote: Pipe, 7½¢; Sheet, 8¢; Tin-lined Pipe, 15¢; and Block, 45¢, all less 10¢ to the trade.

**Spelter and Zinc.**—More demand has developed during the week for Domestic, for which 5½¢ is now firmly insisted upon, Silesian being worth as much. From Europe we are cabled as under: "No change to report. Ordinary, £17 @ £17. 2/6 at shipping ports." We quote Bertha Refined, 8¢, and Bergen Port, 9½¢, while Domestic Sheet Zinc, at a little below the cost of importation, sells currently at 6½¢ @ 7¢, at which the market closes quiet, but firm. "London, Sept. 23.—There is no new feature to report; if anything prices come a little easier from the Continent. We still quote £17 @ £17. 2/6 for ordinaries and £17. 5/ @ £17. 10/ for specials."

**Antimony.**—A fair jobbing demand is noticeable at 13¢ @ 13½¢, Cookson and 11¢ Hallett.

## COAL.

The Anthracite companies invariably speak of a fair trade in progress. They are particularly active in making deliveries under September orders, given in anticipation of an advance in prices, and there is some business offering under the new circular rates. It has become generally understood, however, that the circulars are one month ahead of the bulk of the sales actually made. Taking all together, the tone is cheerful, and later in the month, in the ordinary course of events, the retail trade will add a new stimulus.

The new circular rates promised in this column one week ago, compare as follows:

Common English Pig, £14. 5/ to £14. 76. / By mail we are advised as under: "London, Sept. 23.—Lead is dull, and business has been done in Spanish at £13. 17/6 and even lower. We quote Spanish at £13. 15/ to £14, and English at £14. 2/6 to £14. 5/." There is no change in manufactures. We quote: Pipe, 7½¢; Sheet, 8¢; Tin-lined Pipe, 15¢; and Block, 45¢, all less 10% to be trade.

The Pennsylvania Coal Company's prices are for Coal at Newburgh, the Delaware and Hudson Canal Company at Weehawken, the Delaware, Lackawanna and Western at Hoboken, and the Philadelphia and Reading at Elizabethport.

For Lehigh Coals, as usual, there is no circular. Hazelton is quoted \$4.65 for Stove and Chestnut; \$4.50 for Egg and Broken.

Eastern freights are unchanged.

In Bituminous Coal it may be said that the Cumberland and Clearfield regions are temporarily out of the market, owing to the stoppage of transportation, caused by a break in

the Raritan Canal and the lack of vessels, which have been disabled or driven off by the recent storms. Freight from Baltimore to New York is \$1.75 by canal and \$1.25 by schooners.

The total tonnage of Anthracite Coal from all the regions for the week ending Sept. 23, as reported by the several carrying companies, amounted to 704,705 tons, against 611,457 tons in the corresponding week last year—an increase of 93,248 tons. The total amount of anthracite mined for the year is 20,198,879 tons, against 19,684,826 tons for the same period last year.

## EXPORTS.

Of Hardware, Iron, Machinery, Metals &c., from the Port of New York, for the Week ending Oct. 3, 1882.

Hamburg.	Quan.	Val.
Sew. ma., ch. 1704	33,790	
Clocks, pgs.	35	1,386
Mf. iron, pgs.	196	2,242
Pum., gals.	551,734	49,034
S. rollers, ch.	1	40
Hdw., pgs.	30	1,122
Fig. pr's, pgs.	4	509
Ag. imp., pgs.	3	300
Bremen.		
Pum., gals.	1,015,403	73,339
Ag. imp., pgs.	2	84
Mach. pgs.	3	100
Steel shanks,	6	92
Ch., ch.	2	182
Hdw., pgs.	33	621
Mf. iron, pgs.	7	116
Antwerp.		
Pum., gals.	1,225,857	95,201
Mf. iron, pgs.	3	149
Musket, ch.	35	430
Mach. ch.	2	155
Mf. iron, pgs.	166	2,068
Burners, pgs.	4	253
Hdw., pgs.	7	240
Rotterdam.		
Scalps, pgs.	8	104
Hdw., ch.	4	110
Pum., gals.	33,160	23,000
Ag. imp., pgs.	4	135
Burners, pgs.	19	24
Mach. pgs.	6	650
Amsterdam.		
Pumps, pgs.	8	450
Dutch East Indies.		
Pum., gals.	770,000	80,740
Dutch Guiana.		
Hdw., pgs.	25	320
Pum., gals.	10,000	1,150
Dantzig.		
Pum., gals.	164,321	11,536
Elsinore.		
Pum., gals.	255,340	19,858
Christiana.		
Hdw., ch.	6	71
Copenhagen.		
Hdw., ch.	4	733
Hull.		
Pum., gals.	137,300	10,489
Gibraltar.		
Pum., gals.	79,590	9,000
Liverpool.		
Clocks, pgs.	103	3,385
Mf. iron, pgs.	36	678
Copper matte	36	1,904
Pumps, pgs.	13	1,200
Guns, ch.	3	570
Hdw., ch.	70	2,461
Hdw., ch.	143	2,750
Mach. pgs.	1	768
Arms, case	1	179
Plates, ch.	1	400
Scalps, ch.	1	138
Cop. m., slabs	796	7,000
Headl's, ch.	3	175
London.		
Hdw., pgs.	648	12,375
Sew. ma., ch.	853	14,289
Windmills	2	3,553
Mf. iron, pgs.	13	1,432
Nails, bxs.	19	460
Tubing, ch.	1	509
Pum., gals.	145,100	8,700
Clocks, pgs.	175	6,496
Mach. pgs.	12	17,915
Cartridges, ch.	2	50
Wringers, ch.	4	160
Ag. imp., pgs.	51	1,180
Car wheels, ch.	48	390
Pumps, pgs.	1	1,700
Guns, pgs.	4	1,050
Osaka.		
Scalps, bxs.	12	1,012
Boilers	3	4,419
Iron safes	3	435
Brass, ch.	1	50
Pum., gals.	108,100	7,892
Clocks, ch.	4	369
Castors, ch.	2	19
Ag. imp., pgs.	64	2,073
Sew. ma., ch.	12	50
Pumps, pgs.	13	768
Br. g'd's, ch.	3	350
Iron, pgs.	2	40
Mach. pgs.	1245	5,900
R. R. switches	12	1,000
Mf. iron, pgs.	428	2,689
Hdw., pgs.	88	1,750
Valves, ch.	2	63
Lead pipe, ch.	295	1,074
Tacks, ch.	2	60
Spikes, kegs.	122	757
Copper, ch.	8	314
W. nails, pgs.	33	334
Porto Rico.		
Mach. pgs.	60	2,000
Br'g's, ch.	2	108
Pumps, pgs.	2	20
Sew. ma., ch.	1	15
Pan., gals.	750	123
Ag. imp., pgs.	19	1,152
Mf. iron, pgs.	49	674
Hdw., pgs.	49	674
Clocks, pgs.	3	34
Africa.		
Ag. imp., pgs.	1	65
Pum., gals.	12,000	1,290
Cartridges, ch.	2	12
Mf. iron, pgs.	85	1,779
Pum., gals.	700	21,431
Nails, kegs.	7	28
Iron safes	4	100
Hdw., pgs.	21	437
Sew. ma., ch.	3	53
Brass, ch.	1	69
Brass, ch.	1	69
Pum., gals.	190,000	20,400
Mexico.		
Hdw., pgs.	100	3,086
Valves, ch.	2	2,011
Sew. ma., ch.	255	3,688
Cartridges, ch.	1	100
Tacks, pgs.	4	77
Pumps, pgs.	2	40
Nails, ch.	6	98
Tin, ch.	3	64
Revolvers, ch.	2	6,300
R. R. cars	10	6,180
Iron, bxs.	192	2,400
Met. spgs, pgs.	1	80
Ag. imp., pgs.	54	889
Mach. pgs.	91	6,533
Clocks, pgs.	1	44
Br'g's, ch.	2	107
Cutlery, ch.	2	107
Nails, ch.	48	153
Turn tables	1	1,750
Blocks, case	1	30
Uruguay.		
Mf. iron, pgs.	12	39
Clocks, ch.	1	30
Pum., gals.	11,000	2,600
Ag. imp., pgs.	131	3,400
Copper, ch.	15	401

Car wheels, ch. 50 250  
Mach. pgs. 4 1,250  
Sew. ma., ch. 100 1,550

Trieste.  
Pum., gals. 514,371 45,300

Venezuela.  
Pum., gals. 280 474  
Hdw., pgs. 43 621  
Sew. ma., ch. 18 340  
Cutlery, ch. 12 750  
Mach. pgs. 43 777  
Buckles, pgs. 1 31

Hayti.  
Hdw., pgs. 9 215  
Nails, pgs. 14 68  
Saws, ch. 8 85  
Pum., gals. 6333 785  
Mach. pgs. 23 405  
Zinc, ch. 4 305

Flume.  
Pum., gals. 317,800 24,500

Possuoli.  
Pum., gals. 147,648 9,800

British North America.  
Pig iron, tons. 210 4,850  
Pum., gals. 47,750 5,450  
Hdw., pgs. 6 295  
Cutlery, ch. 1 1,235  
Mf. iron, pgs. 12 225  
Mach. pgs. 27 813  
Valves, ch. 7 349  
Wire rope, coil 1 390  
Arms, case 1 39

Stimpdwe, case 1 138  
Br'g's, ch. 1 138  
Pumps, pgs. 2 52

Havre.  
Pum., gals. 185,910 14,160  
Pumps, pgs. 7 800  
Platina still, ch. 1 1,435  
Sew. ma., ch. 1 15  
Brass, ch. 1 34

Marcellino.  
Pum., gals. 300,000 95,000  
Ag. imp., pgs. 18 995

Rouen.  
Pum., gals. 48,303 34,335

Bordeaux.  
Pum., gals. 300,484 19,155

British West Indies.  
Hdw., pgs. 84 1,253  
Clocks, ch. 2 26  
Mach. pgs. 6 200  
Pumps, pgs. 9 162  
Mf. iron, pgs. 25 277  
Pum., gals. 173,121 12,400  
Ag. imp., pgs. 5 59  
Guns, case, ch. 1 264  
Sew. ma., ch. 1 687  
Nails, kegs. 153 803

French West Indies.  
Clocks, case, 1 6  
Hdw., pgs. 3 26  
Sew. ma., ch. 4 62  
Pum., gals. 4500 510  
Mf. iron, pgs. 3 19

Siagon.  
Cartridges, ch. 1 46  
Ag. imp., pgs. 14 350

British Honduras.  
Mf. iron, pgs. 6 74  
Hdw., pgs. 24 109  
Nails, kegs. 45 190  
Clocks, pgs. 9 92  
Pum., gals. 30 5  
Cutlery, ch. 1 23

British East Indies.  
Rifles, case, 1 68

British Possessions in Africa.  
Ag. imp., pgs. 296 3,795  
Hdw., pgs. 235 2,783  
Mf. iron, pgs. 94 1,210  
Pum., gals. 10,000 1,390

Canada.  
Sh' iron, pgs. 36 603  
Guns, ch. 1 573

New Zealand.  
Mach. pgs. 6 1,916  
Ag. imp., pgs. 9 314  
Pum., gals. 132,450 13,845

Cebu.  
Pum., gals. 380,017 25,862  
Naph., gals. 25,092 1,626

Blaye.  
Pum., gals. 187,643 11,929

Barcelona.  
Mach. pgs. 4 623

Bilbao.  
Pum., gals. 110,904 7,757

China.  
Locks, case, 1 59

Japan.  
Pum., gals. 500,000 57,527

Santo Domingo.  
Nails, kegs. 58 337  
Iron, pgs. 115 429  
Scales, ch. 10 515  
Mf. iron, pgs. 85 1,779  
Pum., gals. 700 21,431  
Nails, kegs. 7 28  
Pump, pgs. 6 314  
Zinc, case, 1 29  
Hdw., pgs. 52 1,137  
Sew. ma., ch. 24 674  
Clocks, case, 1 29  
Ag. imp., pgs. 8 307  
Cutlery, ch. 1 41

United States of Colombia.  
Mf. iron, pgs. 131 1,788  
Sew. ma., ch. 164 3,204



## CLEVELAND PIG IRON

is without specially noteworthy features, there being a large amount of business in hand on old orders, but not quite so much doing in futures. Buyers are rather shy of operating largely so long as there is no definite settlement of the restriction question. Shipments are large, but a trifle below the tonnage of last month, owing to less pressure from the Continent. Current figures for G. M. B. net cash, f. o. b., at makers' wharves in the Tees less 2½ are:

No. 1 Foundry	48 3/4	Mottled	48 3/4
" 2 "	48 3/4	White	48 3/4
" 3 "	48 3/4	Refined metal	48 3/4
" 4 "	48 3/4	Kentledge	48 3/4
" 5 Forge	48 3/4		

In some quarters No. 3 is on offer at 44½. A few American orders are reported, but they do not appear to refer to large lots. Cleveland bars are quiet at \$6.25; plates, \$6.15; and angles, \$6.25, on trucks at works, less 2½ per cent.

## HEMATITE PIGS

are quiet, and mostly unchanged. Deliveries are maintained at full pressure, but there has been less doing on forward account. It is stated that the No. 1 brands, being cheaper at present than best Scotch pigs, are being inquired for by founders, as the hematites mixed with scrap or hard inferior pig make excellent castings. Mixed parcels are quoted \$5.60 @ \$5.75, but makers hold out for the higher limit and are very cautious as to futures. West Coast brands, for ordinary parcels, are as under:

Hematites	No. 1.	No. 2.	No. 3.
Cleator	58 1/2	57 1/2	56 1/2
Lonsdale	58 1/2	57 1/2	56 1/2
Workington	58 1/2	57 1/2	56 1/2
West Cumberland	58 1/2	57 1/2	56 1/2
Lowther	58 1/2	57 1/2	56 1/2
Moss Bay	58 1/2	57 1/2	56 1/2
Distington	58 1/2	57 1/2	56 1/2
Harrington	58 1/2	57 1/2	56 1/2
Solway	58 1/2	57 1/2	56 1/2
Maryport	58 1/2	57 1/2	56 1/2

Last week's shipments were 17,235 tons of hematites, and 6,143 tons rails and blooms. North of England hematite pigs, f. o. b. Cumberland ports, are quoted:

Ordinary Bessemer	58 1/2
No. 1	58 1/2
No. 2	57 1/2
No. 3	56 1/2
No. 4 Foundry	55 1/2
No. 5 Forge	55 1/2
Mottled	55 1/2
White	54 1/2
Fine Metal	54 1/2

THE BRITISH IRON TRADE ASSOCIATION has just issued statistics of the production of pig iron during the first half of 1882, as compared with the last half of 1881, together with stocks on hand on June 30th last, which will doubtless interest many of your readers. The production was as follows:

June 30, 1882.	Dec. 31, 1881.
Cleveland	1,319,543
Scotland	556,500
West Cumberland	472,038
South Wales	470,536
North Wales	45,579
South Staffordshire	109,483
North Staffordshire	159,386
Lincolnshire	102,851
Lancashire	302,668
Northamptonshire	99,475
West and South Yorkshire	151,096
Derbyshire and Nottingham	228,653
Shropshire	39,475
Gloucestershire, Wiltshire, &c.	25,000
Total	4,241,745

\* Estimated.

Stocks of pig iron held by makers and in warrant stores on 30th June, 1882, with corresponding returns for 31st December, 1881:

June 30, 1882.	Dec. 31, 1881.
Cleveland	338,572
Scotland	636,537
West Cumberland	58,523
South Wales	58,523
North Wales	4,437
South Staffordshire	40,573
North Staffordshire	42,851
Lincolnshire	13,803
Lancashire	90,671
Northamptonshire	17,486
West and South Yorkshire	90,615
Derbyshire and Nottingham	20,681
Shropshire	18,930
Gloucestershire, Wiltshire, &c.	5,380
Totals	1,371,769

\* Stocks in warrant stores only, no returns having been received from makers.

The stock of pig iron on December 31st, 1881, was 1,376,262. The production of pig iron during the first half of 1882 was 4,241,745.

Total consumption of pig iron to 30th June, 1882, 4,330,302. Being at the rate per annum of 8,678,784. As against an actual consumption in 1881 of 8,185,513.

Showing a decrease at the rate per annum of 496,272. \* Makers' stocks in Scotland estimated at same figure as that ascertained for January 1, 1882.

## BLAST FURNACE STATISTICS.

According to the special returns of the Ironmaster there are at present 567 furnaces at work in Great Britain out of a total of 950 built. The following figures show the "built" and "idle" in the first and second columns respectively:

	1881	1882
Scotland	148	39
Cleveland	167	46
Cumberland	53	13
Derbyshire	27	6
Gloucestershire	8	6
Lincolnshire	18	4
Lancashire	49	16
Northamptonshire	37	9
North Staffordshire	39	13
South Staffordshire	32	8
Shropshire	25	15
Somerset	1	1
Wiltshire	7	5
Yorkshire	47	18
South Wales	104	100
North Wales	10	4
Total	919	392

Your contemporary reports the furnaces in course of erection as: Workington Hematite Iron and Steel Company, 1; West Hallam Coal and Iron Company, 1; Glendon Iron Company, 1; Holwell Iron Company, 1; Trent Iron Company, 2; Tredegar Iron and Coal Company, 1; Blaenavon Company, 1; Crawshaw Brothers, 4; Elbow Vale Company, 2. At Cyfarthfa the six old furnaces have been abandoned and new ones are being erected near the steel works.

## TIN PLATES

appear to be gradually pruning up, with a healthier tone consequent upon greater regularity of production, the prospect of dearer tin and iron, and an enlarged demand from your market. Messrs. Caine & Layborne of Liverpool, say: "Prices have been more than ordinarily steady during the past month, and within the last few days appearances are in favor of an early improvement in values, especially as the American shipments are large, and the position of tin begins to get stronger. Charcoals have made a distinct advance. Should the present American demand be sustained, it would be no matter of surprise to see higher prices ruling for the remaining months of the year. The requirements for other markets are considered good." It is reported that the stocks at Liverpool are lighter than they were some months ago, but I have no positive information that they are being largely drawn upon. Best charcoals are 21/ @ 23/ per box; seconds charcoals, 19/ @ 20/; best cokes, 18/ @ 18 1/2; second cokes, 17/6 @ 17/9, and common coke, 16/6 @ 17/1, all for I. C. in Liverpool, less the usual 3% for cash.

## THE STEEL RAIL TRADE.

A "communicated" paragraph touching this trade has appeared in some of the papers here and has excited a good deal of comment and curiosity. Its tenor is in this wise: "On Friday, Sept. 10, the representatives of the principal companies and firms manufacturing steel rails met at Dashwood House, New Broad street, E. C., Sir Henry W. Tyler, M. P., in the chair, to discuss the position of the trade. It appeared that the manufacturers of steel rails are only 12 or 13 in number, turning out about 1,200,000 tons per annum, and a strong desire was expressed by many gentlemen present for the formation of an association, with a view to the prevention of undue competition and the lowering of prices beyond what the circumstances appeared to warrant. After a lengthened discussion the following resolutions were unanimously passed: 1. That an association be formed, to be named the Steel Rail Makers' Association. 2. That every company or firm manufacturing steel rails be invited to nominate a member to join the association. 3. That the meeting be adjourned until October 12, to consider a basis, with a view to obtaining information and combined action for improving the position of steel rail manufacturers. 4. That Mr. Whitworth, M. P. (Tredegar Company), Mr. Smith (Barrow Company), Mr. Richards (Bolckow, Vaughan & Co.), Mr. Valentine (Moss Bay Company), Mr. Wilson (Wilson, Cammell & Co.), and Sir Henry Tyler, M. P. (Rhymney Company), be a committee, for preparing agenda for the next meeting, and making proposals for a course to be adopted." I am not quite in a position to say all I know on this matter, but it may be safely stated that the foregoing paragraph does not go down to "hard pan." I believe I am correct in stating that many of the large rail houses were not represented at the meeting, and that several of them have no sympathy with the movement. Some of those who were present deny that there is any intention to force up prices, while others plainly state that it is exactly their object and "nothin' shorter." These latter add that there is no reason why all kinds of Bessemer steel should not be controlled as well as rails, seeing that the trade is in a ring, as it were, and foreign competition is practically unknown. To my thinking the real secret of the movement is the success with which merchants and middlemen have recently competed against makers themselves for certain large orders. As cases in point I may cite the two orders given out by the Government of Victoria. One of these for 33,000 tons was taken by merchants at £6.11/6 delivered, and the other for 30,000 tons at £6.10/4 1/2 delivered at Melbourne. The fight in each case was keen, but the makers lost, hence their chagrin and the movement under notice. At present I forbear from further comment, merely saying that unless all the rail mill owners enter the combination I cannot see how success can possibly be achieved. If all unite the desired ends may be attained with ease and certainty.

## COPPER.

Messrs. Harrington, Horan & Co.'s (Liverpool) report is: Chili copper charters for the first part of this month are not yet to hand but are hourly expected. During the past fortnight Chili bars have advanced in value from £67.15 to £68.10 on the spot, and £68.10 to £69.10, three months prompt. The market to-day is at its best with very few sellers. The sales of furnace material comprise: At Liverpool, 1600 tons Quebrada ore at 13/6, 60 tons Florence ore (rich produce) at 14/ 7/5 Italian ore at 13/6 and 60 tons at 13/7 1/2. At Swansea—about 500 tons Chili regulus to arrive 7/ Maxima, at 14/3, and 320 tons Berezan ore at 13/4. Precipitate—about 845 tons Buiron at 14/ 1/2, and 50 tons Aljustrel at 14/1, and 50 tons (seconds) at 13/9, about 1300 tons Rio Tinto and 50 tons English (sellers works) at 14/3 and 130 tons Rio Tinto Matte at 14/ 1/2 unit. Import of Chili copper during the past fortnight, 911 tons fine, against 570 tons fine same time last year; delivery, 1431 tons, against 1308 tons; import of other copper during the past fortnight, 1078 tons, against 546 tons; delivery, 1847 tons, against 1500 tons. Quotations are, to-day, Chili bars, £68.10 @ £69.10; 15th Sept., 1881, £61 @ £62; 15th Sept., 1880, £60.10 @ £61.10; 15th Sept., 1879, £57.10 @ £58; Chili ingots to-day, £72; 15th Sept., 1881, £63; 15th Sept. 1880, £66; 15th Sept., 1879, £63; Chili ore and regulus to-day, 14/ @ 14/3; 15th Sept., 1881, 12/ @ 12/6; 15th Sept., 1880, 12/ @ 12/3; 15th Sept., 1879, 11/6 @ 11/9; Corcoro Barilla to-day, 14/6; 15th Sept., 1881, 13/3.

Arrivals here during the fortnight of West Coast S. A. produce:

Regulus, Bars, Ingots.	
"Araucania," s. from Valparaiso, &c.	255
"Singer," from Pangu	310
"Arquiza," from Valparaiso	235
At Swansea:	
"Lanthé," from Chanaral and Huasco	634

Stocks of copper (Chilian and Bolivian) in first and second hands, likely to be available, we estimate at:

Regulus, Bars, Ingots.	
Liverpool	2,120
Swansea	3,031
Total	4,221

Representing about 22,620 tons fine copper, against 23,140 tons 31st ult.; 28,388 tons 15th September, 1881; 33,882 tons 15th September, 1880; 32,339 tons 15th September, 1879. Stock of copper contained in other foreign ore and Spanish precipitate, 1688 tons fine, against 520 tons 15th September, 1881; stock of Chili bars and ingots in Havre, 2805 tons fine, against 4005 tons 15th September, 1881; stock of Corro Barilla in Havre, 15 tons fine, against 345 tons 15th September, 1881; stock of copper other than Chili in Havre, 285 tons fine, against 1220 tons 15th September, 1881; stock of Chili copper aboard and chartered for to date, 11,850 tons, against 9200 tons 15th September, 1881; stock of foreign copper in London, chiefly Australian, 7346 tons fine, against 8786 tons 15th September, 1881. According to the Board of Trade Returns, the total imports and exports into and from this country for the first eight months of the following years were:

Imports.	1880.	1881.	1882.
Copper in ores	1880.	1881.	1882.
Copper regulus	5,595	9,105	8,583
Copper precipitate	18,021	18,489	18,308
Bars, cakes and ingots	25,307	30,004	22,642
In pyrites (estimated)	12,000	9,538	11,152
Total	64,923	67,136	60,585

Exports.	1880.	1881.	1882.
English wrought and unwrought copper	20,274	21,643	18,200
Foreign copper, unwrought	10,475	9,305	7,881
Yellow metal	10,778	9,745	12,306
Total	41,527	40,793	38,487

According to advices from Valparaiso the comparative exports of fine copper from Chili and Bolivia to all parts of the world during the first six months of the following years were:

Tons.	1880.	1881.	1882.
1880	18,826	18,777	22,083
1881	18,534	18,777	24,436
1882	24,084	18,777	23,605
1879	24,437		

The relative proportions of the different descriptions of copper being:

	Bar.	Copper	Copper	Total.
	Copper.	Regulus.	Ore.	
1882	83.78	14.32	1.90	100.00
1881	81.16	17.65	1.19	100.00
1880	81.204	16.84	1.975	100.00
1879	82.15	17.00	2.85	100.00
1878	82.15	17.00	2.85	100.00
1877	71.87	14.32	7.99	100.00
1876	78.21	18.41	3.38	100.00

## FOREIGN.

## FRANCE.

(Moniteur des Interests Matériel.)  
PARIS, Sept. 17, 1882.—Metals.—There is nothing in the way now of an active resumption of business for the fall trade. Copper and Tin have been in better request at slight advance, while Lead and Spelter are quieter and barely sustained. We quote to-day: Copper, Chili Bars, 175 @ 178.75; Ingots and Slabs, 184.75; Best Selected, 187.50; and pure Corcoro Ore, 170. Banca Tin, 285; Billiton, 287.50; Straits and Australian, 282.50; and English, 277.50. Lead, 36 @ 37; and Spelter, 44.50 @ 45. Iron.—Dealings in the iron trade in France have slackened slightly, but the favorable outlook continues unimpaired, every price seemingly promising a good fall campaign. At the same time advices from abroad continue encouraging. Our Government will again come out for September 15, with a large railroad-makers order. The total amount of Government requirements for railways will sum up for this year 100,000,000 francs. This will indeed be a great help, nor do we apprehend any giving way of prices in this country for the present. The ordinary orders for Castings and Car Wheels are very large; stocks are exhausted for the moment. Works in the Haute Marne are contented; orders abound and consumers willingly subscribe to 21 francs for Coke Merchant as a basis. The Steel Rails taken by the Government in the Loire and Rhone Basin amounted to 108,352 tons, distributed among 10 works. At the average price of 10.75, Meurthe and Moselle: At Longwy 100,000 tons; Fosse and Creteil: probably 7 francs will have to be paid. There are shown in the Longwy group at this moment 23 blast furnaces, 8 are being erected and only 1 is blown out. The Longwy Steel Works declared 9 1/2 divisions. At the North orders have been received all the way into June next. The North Eastern Steel Works will turn out 300 tons of steel per diem. At Paris iron consumption is as great as ever, on the basis of 20 francs for Meurthe, for Besan and 26 for sheets. The Grenelle forges will resume work in a week. Coal—Has remained moderately active and steady.

## BELGIUM.

(Moniteur Industriel.)  
BRUSSELS, Sept. 18, 1882.—Iron.—The situation of iron industry in Belgium remains a cheerful one; all works, without an exception, are busily engaged, and prices are firmly sustained at the ensuing figures: No. 1, 12 francs per 100 kg.; Besan, 14.50; Corners, 15; Sheets No. 2, 10; No. 3, 21; No. 4, 20; Steel Rails, 30 kg. to the running meter, 16; Steel Hoops, 23.50, and ditto Axles, 21.50. It should be mentioned, however, that consumers operate with a good deal of caution, for they do not seem to feel at all so very sure about the future. Producers, on the other hand, do not trouble themselves about the latter as long as they have plenty of work on hand, in some instances so much so that large orders have to be refused. Thus an Austrian railroad company wanted without delay 1000 railroad freight cars, and had to go elsewhere to get the order filled. Pig Iron is in great demand, and fluctuates around 6.50 francs per 100 kg. Domestic Foundry sells at 7.50. Puddling Pig ranges between 5 and 6 francs. Athus is firm at 5.75, which price is probably maintained for the renewal of contracts in October next. The tendency in finished iron remains a decidedly upward one. An adjudication came off a few days ago at the Northern Railway station for the furnishing of 85 tenders. The Lylo-Bucan Company carried the job at 77.19 francs each for 14 tenders, and the remainder at 50.50 a piece. As the company named has about as much work on hand as it can conveniently attend to, its underbidding other works in this instance has been a subject of surprise. Coal.—The coal trade is unusually active, not only for the supplying of the domestic demand, but even for export. In England there is a certainty of steamers just not for loading coal, hence a good many continental orders are coming this way for immediate execution instead of being forwarded to England.

## GERMANY.

(Borsenhalle.)  
HAMBURG, Sept. 19, 1882.—Iron.—The situation in this vicinity is about the same as it was at the time of our previous weekly report. Our Dortmund correspondent states, "both blast furnaces and rolling mills being well engaged, while at the same time steel works now again receive larger orders for rails. At the Bromberg location Steel Rail adjudication, held a week ago, the Rheinisch-Westphalian Works offered the same at 153 @ 162 marks, at the works. Other smaller adjudications are pending. Great competition is made to our local steel works by de Vreulde & Co., of Foyange, St umm Brothers, at Neukirchen, and the great Thomas Works, at Peine, just gone into operation. For the moment, the latter, I hear, will restrict its output to steel Ingots, but I feel confident that soon the same will begin to make Steel Rails, anything but a pleasing prospect for our works. All other branches are doing well, with the sole exception of the bridge-building one. Coal is active,

with the prospect of a good fall trade; it is to be hoped that next winter may not be as mild as that of 1881-82, when a great many dealers failed in consequence of the giving way of the price of Coal. Miners are getting to be scarce in our Coal regions, the best hands having lately emigrated to the United States; now but comparatively few experienced miners are left. The many accidents in our mines have accelerated the emigration. As matters now stand, Coal of all sorts has been raised a couple of marks per 100 cwts. Metals have remained steady; we quote at the close: Lead, English Pig, 16 @ 16.50 marks per 50 kg.; German ditto, 14.50 @ 15; Copper, 73 @ 77; Spelter, 17 @ 17.25; and Tin, 110 @ 115 marks.

## HOLLAND.

(Koch & Vlierboom.)  
ROTTERDAM, September 16, 1882.—Tin.—During the week under review the market has been remarkably firm, with a gradual advance to 64.50 guilders per 50 kg. Banca, and 64 Billiton, three months' deliveries of both being paid 1/4 to 1/2 guilder above these figures. The demand, we are glad to say, is mostly for consumption.

## EAST INDIES.

(Hessenauer & Co.)  
COLOMBO, Aug. 19, 1882.—Plumbago.—Some sales have been effected during the week at the ensuing figures, in rupees per ton: Fine Lump, 150 @ 155; Ordinary, 135 @ 145; Chips, 75 @ 75 and 100 @ 55. Shipments so far since October 1 have been 198,869 cwts., against last year 159,713; 189,347 in 1880, and 123,365 in 1879. Of the above there were shipped to New York this month 598 cwts. per Sussex from Galle. Exchange, 1/5 1/2.

## DUMMEL &amp; CO.

BATAVIA, Aug. 5, 1882.—Tin.—Shipments from Banca to Java in July have amounted to 30,749 slabs; the next Billiton Government sale of 11,500 slabs is to come off in this city on the 20th inst., to be followed by a similar one on October 31 and on December 31. Iron.—A sale of Swedish Bars has been made at 10 guilders, but the demand is exceedingly limited, also for English Iron; Flat and Square Bars have been done at 6.75 @ 7, and some Copper Sheetings at 56 for assorted sizes. Steel at 90. Wire Nails, 11.50 with sales; Iron Nails, 11. Coal is worth 21 @ 22. Exchange, 11.95.

## INDUSTRIAL ITEMS.

## MAINE.

The Dunn Edge Tool Company, at Waterville, are making improvements to their works which will double their capacity.

Ninety thousand dollars have been subscribed of the \$100,000 required to build the proposed machine shops at Bath.

## MASSACHUSETTS.

The Gosnold Mills, at New Bedford, are now employing about 100 men, and are consuming some 5000 tons of scrap iron per annum. This is largely worked up into chains, of which all descriptions are made, ranging from the lightest up to 20 pounds to the inch. The chains made by the Gosnold Mills have a very high reputation.

The Pettie Machine Works have organized at Newton with a capital of \$200,000 for the purpose of manufacturing and selling machinery. Henry Billings is the president.

The Lanesboro' Iron Company, whose furnace was damaged by fire on the 25th of last June, have been much delayed in the work of repairing by an insurance controversy, but will try to patch up their stack this fall and supply their heaviest customers.

The J. R. Torrey Razor Company, of Worcester, have occupied their new brick building, which is 42 x 126 feet and four stories high. The company, besides their large output of razors, manufacture over 100 varieties of razor strops.

## RHODE ISLAND.

The Pawtucket Manufacturing Company, of Pawtucket, manufacturers of bolts, cold-punched nuts and washers, iron and steel screws, cap screws, chain links, stirrups, &c., are now prepared to effectually meet the increasing demand for their products. Their shops are fitted with Webb's revolving forge furnaces, and their machinery is of modern design and provided with all improvements. Mr. Webb, who is the agent and also the patentee of the revolving furnace bearing his name, has had considerable practical experience, having been in the employ of Messrs. W. H. Haskell & Co., of Pawtucket, for more than 15 years. The treasurer, Mr. Geo. H. Fowler, was for a long time connected with the Providence Tool Company, and the experience which he gained in this position will undoubtedly yield fruitful results. Mr. Stephen A. Jenks, the president of the company, has likewise had the advantages of long experience, and under the engagement of these three gentlemen the prosperity of the establishment cannot be doubted. The shops are well ventilated and lighted, and no efforts have apparently been spared to make them agreeable and healthy. The offices are arranged in a pleasing and attractive manner, the drafting rooms are well situated, and, in fact, everything points to convenience and good taste.

## CONNECTICUT.

A fire broke out about 10.20 o'clock p. m., October 3, in the machine room of Watson's Iron Works, Bridgeport, and spread so rapidly that the entire wooden structure was soon in flames and burned to the ground. Despite every effort of the fire department, the flames spread to the wooden buildings, five in number, of the Craighead & Elwell Mfg. Co., totally destroying them all except the office and foundry. The Watson Iron Works were owned and occupied by James Watson, Jr., manufacturers of iron toys and light-gray iron castings. His loss will reach \$20,000 on buildings, stock and fixtures; insured for \$14,500 on buildings and fixtures, but no insurance on the stock. The Craighead & Elwell Mfg. Co. owned and occupied the adjoining factory, and were largely engaged in the manufacture of kerosene-lamp goods. They estimate their loss on buildings, stock and fixtures at about \$35,000, fully covered by insurance, there being \$44,000 insurance on all, which amount also covers the foundry which was not burned. Both the companies were driven with work, and altogether about 225 employees are thrown out of employment.

## NEW YORK.

A large windmill and massive pump was shipped per steamship Grecian Monarch, a few days ago, for Port Elizabeth, South Africa, via England. The mill was made for pumping purposes, by A. T. Corcoran, of this city, and was complete in every detail, as well as having a wrought-iron tower, 50 feet high, to support it, the first and only

frame of this description ever exported for such a purpose. The entire shipment numbered 150 packages, some of which weighed 2975 pounds. The pump weighed, when boxed, 800 pounds, and is intended to elevate water 100 feet, through 2250 feet of pipe. The outfit was made to order for E. Geo. Woodford, an American engineer, formerly with W. W. Evans, a constructor of railroads in Peru. Windmills of smaller size have been shipped to Port Elizabeth for use on ostrich farms.

## PENNSYLVANIA.

No. 1 blast furnace of the Phoenix Iron Company, 15 feet high, 58 1/2 feet high, was put in blast December 9th, 1879. Owing to an accumulation of pig iron, as a result of the lock-out this year, it became necessary to stop production, and it was resolved to put the furnaces out of blast. Mr. C. I. R

IF DEALERS WILL LOOK INTO THIS MATTER OF

**JACK SCREWS,**

Diam. of Screw.	Height.	Net rise.	Whole height.	List Price.
1/4 inches	10	4	14	\$2.50
3/8	12	5	17	3.00
1/2	14	6	20	3.25
5/8	16	7	23	3.75
3/4	18	8	26	4.00
7/8	20	9	29	4.25
1	22	10	32	4.50
1 1/8	24	11	35	5.00
1 1/4	26	12	38	5.50
1 1/2	28	13	41	5.50
1 3/4	30	14	44	6.00
2	32	15	47	7.00
2 1/4	34	16	50	8.00
2 1/2	36	17	53	8.50
2 3/4	38	18	56	9.50
3	40	19	59	11.00
3 1/4	42	20	62	13.00

**MILLERS FALLS COMPANY**

74 Chambers St., New York.

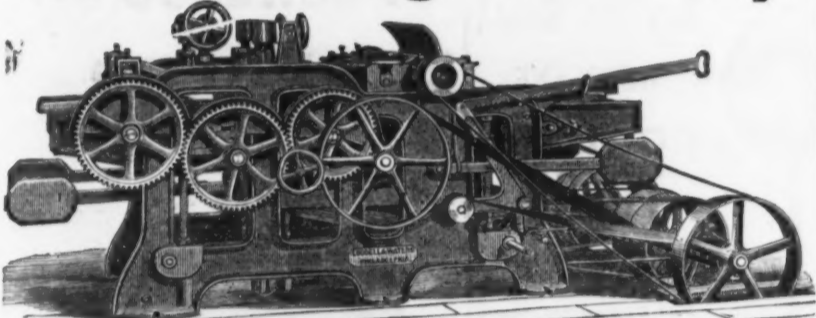
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Vergennes, Vermont.HOT FORGED AND COLD HAMMERED POINTED. MADE OF BEST  
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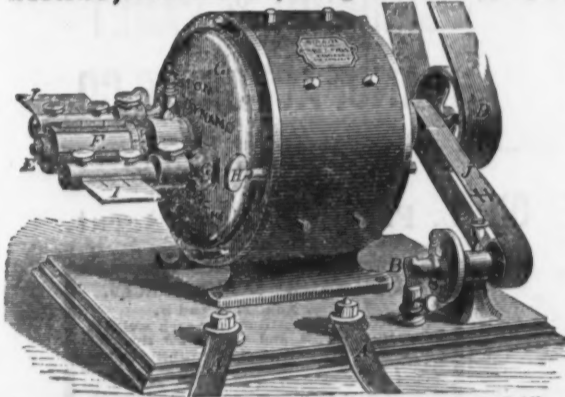
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Are used by all leading stove  
manufacturers.Experienced men sent to put  
up machines and instruct pur-  
chasers.**INFRINGEMENTS.**We call attention to infringe-  
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are used to prevent change of  
current. The Weston Co. are  
owners by grant or purchase  
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Switches for Plating Machines.  
The adoption of these ma-  
chines will certainly lead to  
great loss to parties purchasing  
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Cast Nickel Anodes, Pure  
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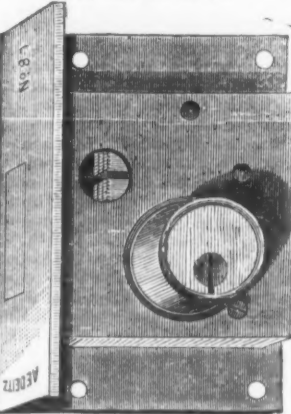
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award and medal for Noiseless Steel Shutters at  
Philadelphia, 1876; Paris, 1878, and Melbourne,  
1881.**CLARK, BUNNETT & CO.,  
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Original Inventors and Sole Patentees of

**Noiseless Self-Colling Revolving****STEEL SHUTTERS,**

FIRE AND BURGLAR PROOF. ALSO IMPROVED

**ROLLING WOOD SHUTTERS,**

Of various kinds. And Patent

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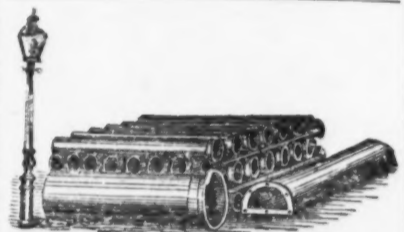
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**PATENT****Screw Wrenches**

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Our Genuine Wrenches are made with  
straight bars, full width and enlarged jaw, hav-  
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our claim that we manufacture the heaviest  
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**ELECTRIC HAY KNIFE.**A perfect Implement for cutting Hay and Straw, or even Muck or Turf. Just the  
article for cutting Silos. The handles are so arranged that the operator can stand erect  
and put his strength directly upon the Knife.

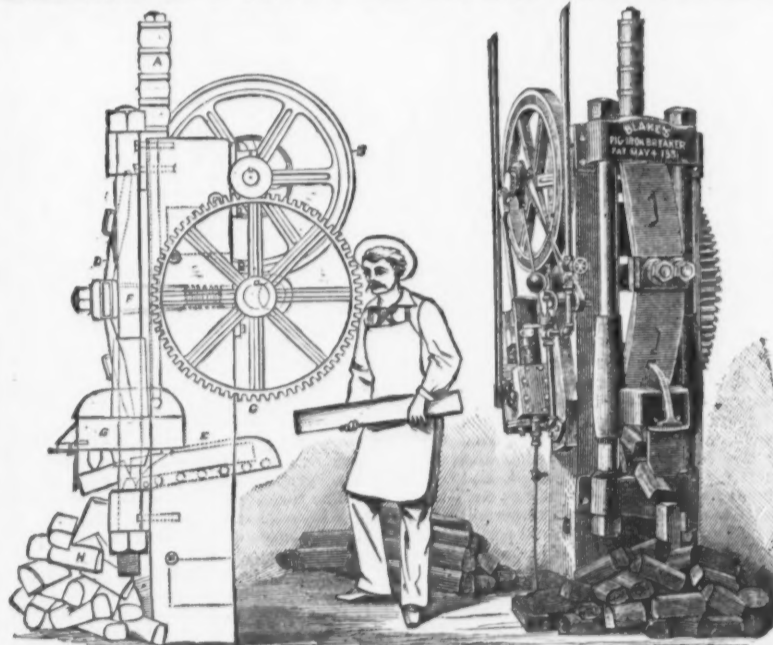
The shape of the teeth gives the Knife more cutting edge than any other Hay Knife.

The Blade of the Extra Knife is solid cast steel, gold bronzed and polished. The

Blade of the No. 2 is steel, with iron back, painted green.

**ELECTRIC HAY KNIFE LIST:****EXTRA CAST STEEL, per dozen, - - - \$18.00****No. 2, STEEL, per dozen, - - - \$15.00****LLOYD, SUPPLEE & WALTON,**

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**BLAKE'S PAT. PIG IRON BREAKER.**A new and successful machine for breaking pig iron into any length desired, with rapidity and  
economy. Besides saving in cost of breaking by hand, it secures the greatest economy in melting.  
Several machines already in use. Every machine guaranteed against breakage of parts. Requires  
but three horse-power. Can be run by belt or have small engine attached.

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Manufacturers of

**IRON & BRASS WOOD SCREWS.**Quality, finish and tests as to strength guaranteed equal to any  
in the market.With improved facilities and largely increased capacity for  
production, we can fill orders promptly, and invite inquiries for  
discounts. A full line in stock.

### Mining and Metal Working in Austro-Hungary.

The following very interesting particulars of the mining and metallurgical industries of the Austrian Empire are taken from the exhaustive report prepared by Prof. August Vierthaler, in connection with the exhibition now open at Trieste. Mineral mining and ironworking are important industries in certain districts of Austria, as may be seen from the fact that the total value of ores and metals produced in 1880 was nearly 80,000,000 florins.

The mines number 781, and the works for the reduction of the ores and the preparation of the various metals 137, giving altogether employment to 104,000 workmen, of which number about 10,000 are engaged in the salt mines, and a similar number in iron and metal founding. The yield of the various mines in 1880 was as follows: Of auriferous ores, 55 cnt. in Bohemia, and 1225 cnt. in Salzburg, worth 15,300 florins; and of argentiferous ores in Bohemia (principally Pribram), 125,732 cnt., valued at 3,133,559 florins. From these ores the yield of gold in Bohemia was .05, in Salzburg 17.69, and in the Tyrol 23.596 kg., worth 58,300 florins, the production of silver being in Bohemia 29,877, in Steiermark 178.2 and in the Tyrol 202.1 kg., valued at 2,696,108 florins. Quick-silver ore was obtained mostly in Idria (Krain), to the extent of 453,640 cnt., worth 483,972 florins, the yield of pure quicksilver being 3691 cnt., realizing 775,679 florins. Of copper ore, Bohemia, Salzburg and the Tyrol produced 49,268 cnt., worth 205,475 florins, which, when smelted, gave 5000 cnt. of copper, valued at 382,157 florins. The iron ore bearing strata are found principally in central Bohemia (in the Silurian formation between Prague and Pilsen), and in the three spathose ironstone tracts of the Alps, in Styria, Carinthia, the Tyrol and Krain, the deposits near Eisenerz in Styria and Hüttenberg in Carinthia being the most accessible and practically inexhaustible. The aggregate quantity of iron ore mined in 1880 was 6,968,000 cnt., valued at 1,982,246 florins, yielding 3,203,000 cnt. of pig iron, worth 15,253,000 florins, from which was obtained 2,863,000 cnt. of refined iron, selling for 13,091,293 florins, and 339,818 cnt. of foundry pig iron, worth 2,161,800 florins. The separate iron mining undertakings number 239, and the smelting establishments 115, with 155 blast furnaces, the former industry employing 4500 men, and the latter about 8000. Bessemer iron is manufactured at 10 works, viz.: Turrach, Heft, Neuberg, Witkowitz, Ternitz, Zeltweg, Teplitz, Trzinietz, Kladno and Přívali, the annual output being about 885,000 cnt. The Siemens-Martin process of steel making is carried on at Graz, Donawitz, Neuberg and Witkowitz, the aggregate quantity produced yearly being some 200,000 cnt. Crucible steel is manufactured in Styria and Lower Austria, but only on a small scale, and not exceeding 35,000 cnt. annually. Lead ore amounting to 108,000 cnt., worth 1,144,012 florins, was extracted in 1880 from mines in Bohemia, Styria, Carinthia, the Tyrol, Krain and Galicia. Of pure lead some 56,000 cnt., having a market value of 1,086,868 florins, were manufactured. Protoxide of lead figures for 36,000 cnt., valued at 652,000 florins; and nickel and cobalt ores for 159 cnt. and 1103 florins. Zinc ore is found in the same districts as lead ore, and in 1880 some 215,500 cnt., realizing 286,537 florins, were mined, from which zinc amounting to 37,557 cnt. in weight and 712,712 florins in value was obtained. Only very small quantities of tin are found, and these chiefly in northwest Bohemia, the total averaging under 300 cnt., worth about 35,000 florins annually.

Of the minor mineral products, chiefly confined to Bohemia, antimony figures for 1250 cnt.; uranium, 28.39 cnt.; and Wolfram ore, 596 cnt. Of pyrites, 104,660 cnt., valued at 112,212 florins, and of sulphur, 4000 cnt., valued at 30,000 florins, were obtained. Manganese ore, found in Bohemia, Upper Austria, Bukovina, Styria, Carinthia and Krain, amounted to 88,774 cnt. in weight and 77,837 florins in value.

Coal-mining is carried on extensively, both brown and black coal being obtained, the former to the extent of 84,000,000 cnt., worth 15,375,000 florins, and the latter to the extent of 59,000,000 cnt., realizing 20,000,000 florins. There are 940 collieries, employing 29,000 workmen engaged on brown-coal winning, and 367 mines, worked by 35,500 hands, employed in the raising of black coal.

The Customs returns show that of the above enumerated mineral products Austro-Hungary exported in 1881 of iron ore 458,124 cnt., and imported 207,643 cnt. Of Calamine and other zinc ores the export was 26,300 cnt., and the import nil. Of cobalt and nickel ore 2397 cnt. were exported, and 1425 imported; and of lead ore 26,325 cnt. were exported, and only 238 cnt. imported. The export of pig iron for the same period stands at 120,572 cnt., and the import at 742,440 cnt. Of scrap iron, iron filings, and hammer slag 383,370 cnt. passed into the country, and 11,064 cnt. were sent away. Of manufactured and unmanufactured steel 39,684 cnt. were exported, and 8577 cnt. imported. Of refined iron not otherwise manufactured the figures are 85,283 and 19,763 cnt. respectively. Of crude zinc 83,142 went out and 5799 cnt. came into the country, the exports of crude lead being 20,185 cnt., and of crude copper 52,000 cnt. Of black coal 21,044,134 cnt. were imported (mostly from Prussia), and 6,727,008 cnt. exported, while of brown coal the figures were respectively 76,536 and 28,836,316 cnt.

The manufacture of steam engines, machinery and implements is steadily growing, and at present there are 260 such establishments, employing 30,000 workmen. This industry, however, is chiefly confined to Vienna and neighborhood, Lower Austria, Prague, Brinn and Graz. The total number of steam boilers of all kinds, including those on railways and steamboats, at work in 1876 was 16. Since that time the number has largely increased, and other motors, such as gas engines, turbines and water wheels, have been more largely introduced.

The manufacture of sewing machines is a comparatively new branch of industry in Austria, and whereas formerly all these articles were imported, there are at the

present time 13 factories, employing 300 men, engaged in the production of sewing machines, the total value of the turnout in 1880 being 500,000 guilder. In 1881 15,300 cnt. weight of sewing machines were imported and 1421 cnt. exported.

The Austrian iron and steel ware manufacture is one of the oldest and most important of the country, giving employment to many thousands of persons in large establishments as well as in small. Of scythes some 6,000,000 or 7,000,000 are manufactured annually, of sickles from 1,000,000 to 1,500,000, and of chaff-cutters, &c., upward of 200,000. The chief seats of this industry are in Upper Styria and Upper Austria, where over 3000 workmen are employed. In 1881 Austria exported 33,977 cnt. of scythes and sickles. The manufacture of nails, chains, knives, shears, horseshoes, &c., is carried on in Bohemia, Moravia, Upper and Lower Austria, and Styria, and gave employment in 1875 to 26,000 persons. The principal center of the cutlery trade, however, is in the Steyr district, where in 1880 there were 239 manufacturers of knives and 24 makers of other blades. The lock trade has assumed somewhat larger dimensions of late years owing to the activity of building operations in Vienna, Prague, Trieste, &c., and several large factories have been established in the capital city. A widespread industry of the country is the manufacture from iron wire of tacks, screws, rivets, nails, ropes, &c.

In 1881 Austro-Hungary exported 2905 cnt. of wire nails. Wire-rope making is confined to Bohemia and Carinthia, and in 1881 it was necessary to import rope to the extent of 1799 cnt. Since 1853 the Viennese have developed an industry in fire-proof safes, and some few works have more recently been established in Prague and Graz. For these productions a ready market is found in the East, whither they are shipped via Trieste.

The manufacture of cooking apparatus from sheet and cast iron has assumed moderately large dimensions, and serves not only to supply most of the home requirements, but to furnish a not inconsiderable margin for export, the quantity of enamelled cast apparatus so exported in 1881 reaching 6350 cnt.

Needles are made at two establishments only, one at Hainburg and one at Fügen (Tyrol), the bulk of the native requirements being imported (421 cnt. in 1881). Weapons (other than for military purposes) are made on a very limited scale, and principally at Ferlach in Carinthia, Vienna, and Weipert in Bohemia. The export of small arms in 1881 amounted to 9200 cnt., and of the other weapons to 1018 cnt. The manufacture of lead into shot, balls, sheets, pipes and plates is unimportant, and the same may be said with regard to the production of wire, pipes and cooking utensils from copper. Zinc working is, however, more largely practiced, but chiefly in Vienna and district. Of zinc in bars and sheets 4574 cnt. were imported, and 5542 cnt. exported in 1881. The total of fine and common quality metal goods exported in 1881 was 18,483 cnt., the imports being 10,233 cnt.

### The Utilization of Phosphatic Metalliferous Slag.

Mr. George Lecour, of Liège, Belgium, has patented an invention having for its object improvements in the utilization of phosphatic metalliferous slags by extracting from them, in a commercial form, the metallic oxides and phosphoric acid which they contain. The process is specially applicable to the treatment of the slags produced in dephosphorizing iron, either in a Bessemer converter or by the basic process, or in puddling and reheating furnaces. The first operation consists of reducing melting, conducted by preference in a cupola or a blast furnace, with a view of concentrating into a phosphatic mat almost all of the iron, manganese and phosphorus of the slag. In order to best attain this end, the slags are assorted so as to insure the decomposition of the phosphate of lime which they may contain, by a suitable proportion of silica, forming a slag containing from 30 to 40 per cent. of silica. In place of this method, however, silicious matters may be added so as to realize the conditions required.

When circumstances render it economical, it is found advantageous to introduce the silica necessary for the treatment of the basic slags of dephosphorization (which contain an excess of lime) by putting puddling slags (which contain an excess of silica) into the melting bath. It is advantageous to charge the slags in as finely divided a state as possible, so as to facilitate the reduction of the metals and phosphoric acid, and this state of division can often be obtained with advantage by granulating the melted slags in water. The furnace should be kept very hot during working, so as to insure the reduction of the phosphoric acid and the manganese, as in the manufacture of ferromanganese. The phosphatic mat obtained is run into masses as small as possible, or, better still, is granulated in water, so as to facilitate its subsequent treatment by wet process. This mat is then treated with sulphuric or hydrochloric acid in receptacles as little attacked by these acids as possible (stone, brick, earthenware, wood, lead, with the joints coated or impregnated with tar or resin), under the best conditions of pressure and temperature which experience determines, a steam jet allowing the temperature to be raised at will, and even the pressure by working in a closed vessel. In the latter case, the receptacle should be of iron, lined with the materials indicated above. The action of the acids on the mat gives rise to a disengagement of hydrogen gas and phosphoretted hydrogen, which are conducted by a pipe to a series of burners, placed so as to heat a small reverberatory or combustion furnace. At the end of this furnace is a chimney leading into the top of a condensing column formed of descending pipes cooled on the outside by water, or the surrounding air, or by a spray inside. The hydrogen gas and the phosphoretted hydrogen burn, producing steam and phosphoric acid, which are drawn into the condensing column, and are collected at the bottom in the form of aqueous solution of phosphoric acid. This solution is concentrated by evaporation, and the phosphoric acid so obtained forms a valuable

commercial product. The matt dissolved by the acids gives rise to a solution of chloride or sulphate of iron and manganese more or less pure, and which may contain, in the form of acid phosphate, a greater or less proportion of phosphorus, according to the more or less oxidizing conditions which existed during the attack of the matt. If the solution was made with hydrochloric acid, the iron and manganese are precipitated, either together or separately, in the state of oxide, simply by the addition of lime in excess, or a measured quantity of carbonate of lime (chalk) may first be added. In place of lime, it is found advantageous to employ, when available, basic refinery, slags finely ground and containing an excess of lime. Under these conditions the oxides of iron and manganese, and the phosphoric acid of these slags, are added to the precipitated oxide and phosphate of iron, and thus avoid the cost of concentration of the corresponding mat. The phosphoric acid is precipitated in the state of basic phosphate of iron, accompanied by the oxide of that metal. To effect the separation of these two products and to obtain directly the phosphoric acid in a convenient form for chemical manures, the ferro-phosphate precipitate is mixed with commercial phosphate of potash, and the mixture is calcined to a red heat in a reverberatory furnace. The calcined mass is then treated with water, which leaves an insoluble residue of oxide of iron, and dissolves the phosphate of potash, which is easily separable by evaporation or crystallization. The phosphate of potash thus obtained constitutes a new commercial product applicable directly as a manure, with or without mixture, with lime or other substance, or manure, or saleable to manufacturers of chemical manures, according to the proportions of its two elements, phosphoric acid and potash. If under certain circumstances it is judged to be preferable to produce the phosphoric acid in the form of precipitated phosphate of lime, it suffices to add lime to the phosphate of potash and to evaporate to dryness the decanted or precipitated solution, so as to obtain the potash in the caustic state. Sulphate of soda may in the last case be substituted for sulphate of potash.

The precipitates of the oxides of iron and manganese obtained, mixed or separate, as has been described above, are sold to manufacturers producing iron or speiseleisen or ferromanganese for well-known uses—glass for painting, iron minium rouge for polishing, glass-makers' soap, linings for puddling furnaces, &c. If sulphuric acid has been used for the solution of the mat—then the greater part of the phosphorus will have been obtained in the form of phosphoric acid, and the solution will contain a proportion too small to justify the cost of a special treatment to separate it. A part of the iron can then be obtained either by crystallization in the state of sulphate (green copperas of commerce) or the two sulphates of iron and manganese, obtained by evaporation to dryness may be decomposed by heat by calcining them in a closed vessel communicating with a suitable condensing apparatus, as in the Nordhausen manufacture of sulphuric acid, or in a reverberatory or muffle furnace, communicating with lead chambers, thus recovering the acid used in the treatment of the phosphatic mat. The local economical conditions as to the price of the acids and the value of products obtained will determine which of the above-described methods is to be preferred. The decomposition of the granulated or pulverized mat of phosphoric iron can also be effected by a current of superheated steam, or of hydrochloric acid gas or of gaseous chlorine. In this latter case the chloride of phosphorus produced is decomposed by water ultimately into phosphoric acid and hydrochloric acid, which is separated by evaporation or distillation, the phosphoric acid remaining fixed.

### LABOR AND WAGES.

A compromise has been effected between Messrs. Reis Bros., Newcastle, Pa., and their recalcitrant employees, by which the establishment was to start up last Monday.

A notice has been posted up in the coal banks of the Beaver Valley, Pa., announcing that a reduction of 10 cents per bushel in the price paid for mining was to take place on October 1.

A dispatch from Dayton, Ohio, says that 25 molders employed in the pump works of Smith Vail & Co., struck on account of the introduction of piecework and the discharge of the foreman. Efforts were made to employ non-union men, but the strikers prevented them from reaching the building. A guard of police is stationed there.

The Wheeling manufacturers have signed last year's scale and resumed work.

The boys who struck at the Somerville Glass Works, Mass., for an increase of pay have all returned to work, in consequence of the threat of the Chief of Police that otherwise he would compel them to go to school. The strike was for an increase of 8 cents a day. If the boys were of an age that the Chief of Police could compel them to go to school, they should be there.

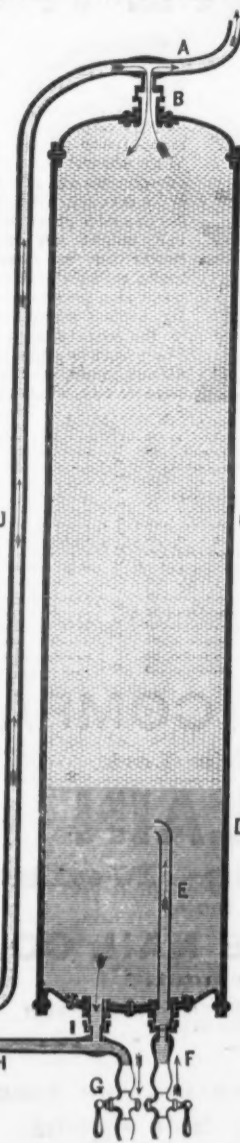
Through an excess of current accidentally brought about, the wires for conducting the electricity for illuminating the stage of the Paris Opera lately became red-hot, burnt their covering of gutta percha, and caused a fire, which, however, was speedily extinguished with a few buckets of water. Such events as these are of the class that result from what must be culpable carelessness.

According to reports from Glasgow, Scotland, the ironmasters have resolved not to continue the agreement to restrict the output of pig iron.

**ETHELBERT WATTS,**  
IRON BROKER AND COMMISSION MERCHANT,  
No. 326 Walnut St., Philadelphia.  
Pig, Muck and Bar Iron, Scrap, Etc.  
Also, COKE AND BIT. COAL.

### HOT WATER IN FIVE MINUTES.

**Creque's Patent New Circulation Range Boilers.**  
13 Different Styles, Adapted and Warranted for Every Possible Situation.  
**CREQUE, RONALDS & CO.,** 54 Cliff Street, New York,  
SOLE MANUFACTURERS.  
SEND FOR ILLUSTRATED CATALOGUE.



**Buy the Best!**  
—  
**KEROSENE OR COAL OIL TORCH.**

The Largest Flame!  
THE WHITEST LIGHT!  
For Foundries, Store Houses, Blacksmith Shops, Street Illumination, Etc.

**Hull Vapor Stove Co.**  
CLEVELAND, O.



### BILLINGS' PATENT OIL VAPOR TORCH.

This torch burns the common Coal Oil, good water-white Coal Oil being preferred. The oil is converted into a vapor which burns like gas, without wick or chimney, and produces a most powerful light, easily regulated by a needle-valve. This Torch has now been in use some two years, and its sale is steadily increasing. It is especially adapted for

Foundries, Factories, Machine and Work Shops, and is so constructed as to withstand the hardest usage.

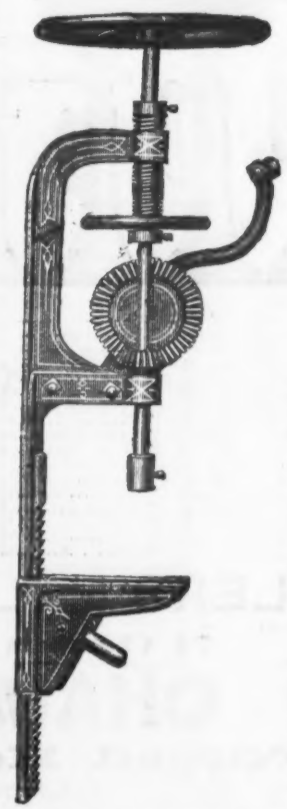
**CAUTION.**—To protect the public from the inevitable consequences of using or vending a device covered by Patent, when put upon the market by unauthorized parties (and often with some slight change in construction, amounting to nothing more than a mechanical equivalent), we will state that we are the inventor and sole owner of the only Letters Patent on a Coal Oil Vapor Torch, which Patents are dated July 15th, 1880, No. 228,799, and March 8th, 1881, No. 238,633. We have also to state that we have commenced suit in the U. S. Circuit Court for the Northern District of Ohio, against parties infringing our rights, which we shall prosecute to the end; and all will hereafter be held to strict account for any violation of our rights.



**G. W. BILLINGS,**  
393 Bond Street, CLEVELAND, OHIO.

### NEW IMPROVED UPRIGHT DRILL FOR BLACKSMITHS AND MACHINISTS.

THIMBLE SKELNS, BLACKSMITHS' TOOLS, JACK SCREWS,



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3 Sizes, Nos. 1, 2 and 3.  
A mechanical substitute for sash weights. In use in the U. S. and abroad for the past four years with satisfaction, proven by constantly renewed orders. Valuable improvements added in 1882. The sashes work with them as with weights; they avoid all complications, and are applied at one-third the cost of applied weights.

Prices: No. 3, 80 cts.; No. 2, \$1.00; No. 1, \$1.25, per set (4). Sample sets mailed to any address free, on receipt of above price. Beware of a fraud balance having the copied date of one of my patents (Nov. 6th, 1877) cast upon it to deceive the public, and avoid future trouble for infringement. The genuine goods never have this date upon them, as it is a minor patent only. Address the patentee and solely authorized maker.

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Hartford, Conn., U. S. A.  
If not kept by your hardware dealer, send a line as above yourself.  
L. MENDENHALL, N. W. cor. Race & 4th Sts., Agent at Cincinnati, Ohio.



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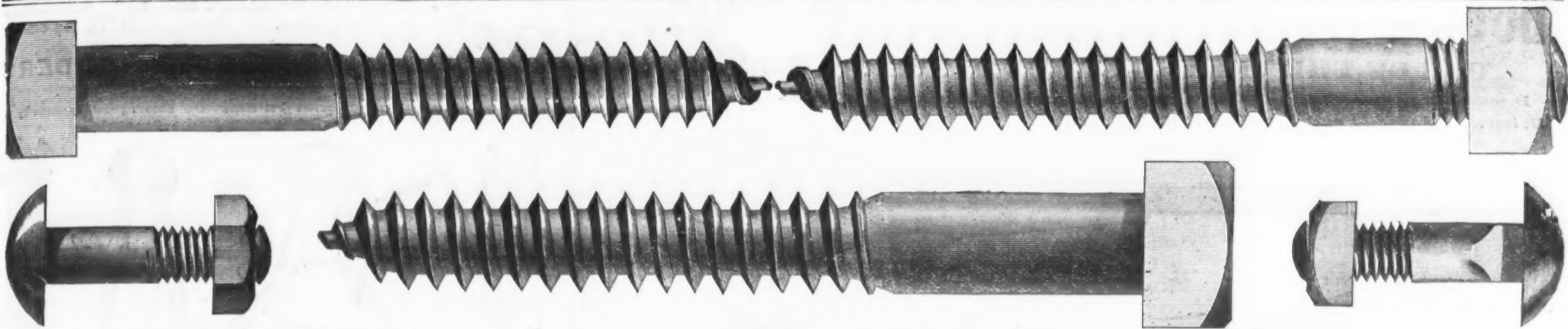
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**CLARK SINTZ**

Springfield Ohio.



Wm. H. HASKELL, Pres.

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**Wm. H. Haskell Co.,**  
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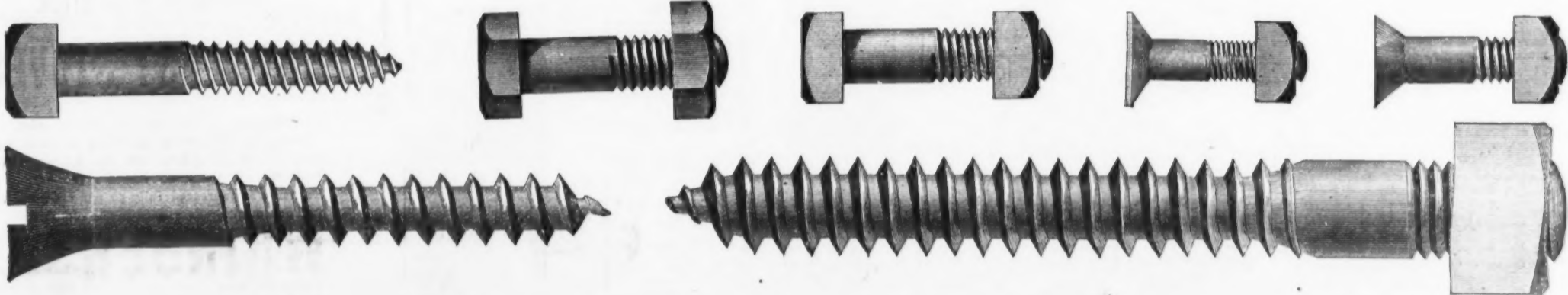
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HENRY B. NEWHALL, 105 Chambers St., New York Agent.

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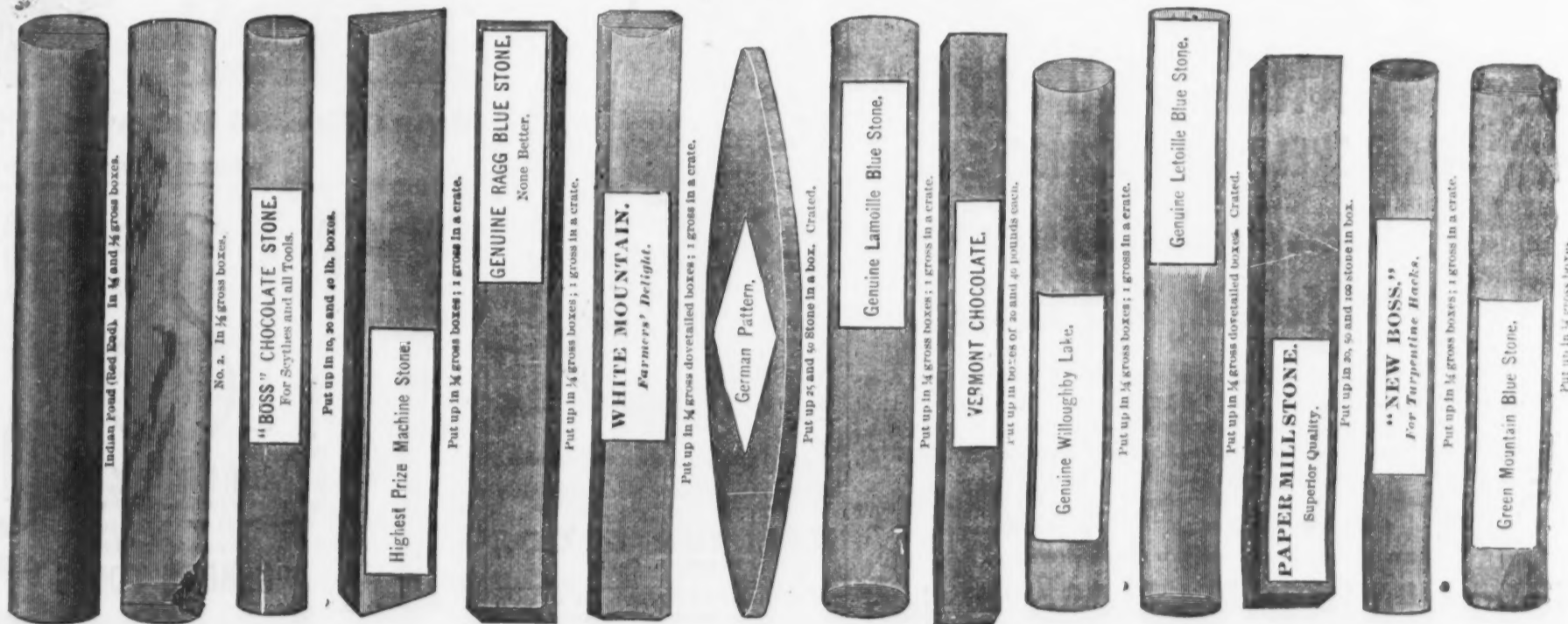
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259 & 261 Randolph St.,  
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Power, Screw, Hand, Foot  
and Drop

## PRESSES, DIES,

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Sheet Metal Workers.

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20,000 Sold the Second Year.  
THE BEST ADJUSTABLE BAG HOLDER  
In the World. PRICE ONLY \$1.50.



Sent free, on receipt of the price, anywhere in the United States. Just the thing for the Farmer, Thresher, Miller, the Feed Store, Grain, Potato, Guano and Phosphate dealers, Postmasters and Publishers, and to all others who use Sacks or Bags it is indispensable. A perfect and simple device, made of iron, and will last a life time. Sold by the Hardware Trade everywhere. Orders solicited. The platform is extra if wanted. Agents wanted everywhere. Address L. JEFF. SPRENGLE, Sole Manufacturer, Ashland, Ohio. None can do without it for \$1.50. Send for a circular. Special discount to the trade. Will furnish a sample down to the trade during the month of January at the low price of 75c.

Established 1855.

KEYSTONE WORKS.

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**GEORGE GRIFFITHS,**

MANUFACTURER OF



Shovels, Spades, Scoops,  
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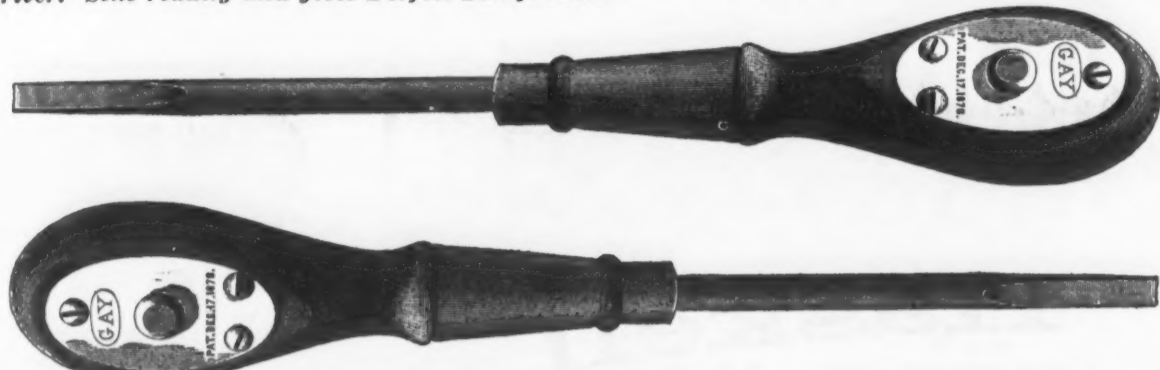
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PHILADELPHIA, PA. U. S. A.

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# DOUBLE ACTION RATCHET SCREW DRIVER.

ONE OF THE VERY BEST TOOLS EVER INVENTED.

It combines greater Strength, Convenience and Durability than was ever obtained in a Common Driver. Sells readily and gives Perfect Satisfaction.



Trade supplied by the principal Jobbers throughout the U. S. or by the manufacturers,  
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FLAGLER, FORSYTH & BRADLEY, Agents, 295 Broadway, New York. Send for Price List.

## THE Morgan Variable Blast WATER TUYERE IRON

With the front plate removed, showing the rotating air tubes, through which four different currents of air may be passed, thereby making any sized fire, from two to eighteen inches in diameter. It actually SAVES ONE HALF of the coal, makes an intense heat just where it is needed, and burns NO coal unnecessarily; always gives a center blast, and cleans all the dirt from the fire; supplies hot water. We also furnish a Tuyere on same principle without water attachment. All goods guaranteed to please or no sale. Catalogue sent free. Special inducements to the trade. Address

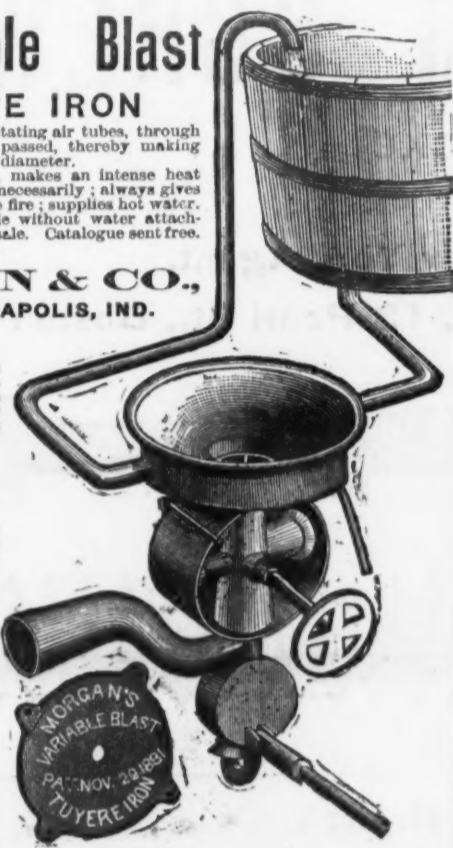
**A. W. MORGAN & CO.,**  
52 VANCE BLOCK, INDIANAPOLIS, IND.

INDIANAPOLIS, July 11, 1881.  
Messrs. A. W. Morgan & Co.  
Gentlemen: I have tested your Variable Blast Tuyere Iron, and pronounce it a perfect success. It does all you claim for it. Makes a large or small fire at will; gives a center blast; saves time, labor and coal, and it heats much more rapidly.  
AUGUST ALTON.

NIRVANA, MICH., Oct. 10, 1881.  
A. W. Morgan & Co.  
Dear Sirs: I have tested your Variable Blast Tuyere Iron perfectly. I can take a larger heat with less coal and labor than any other iron I ever saw. It is second to none. I have welded a four-inch bar with the smallest blast for a test.  
Yours truly,  
DANIEL MERV.

LEXINGTON, MICH., Oct. 16, 1881.  
A. W. Morgan & Co.  
We are well pleased with our Tuyere Iron. It gives the best satisfaction, and is a great saving in coal.  
W. J. BAKER & CO.

INDIANAPOLIS, IND., April 28, 1882.  
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Dear Sirs: We take great pleasure in recommending your Tuyere. We believe it is the very best made. Yours,  
INDIANAPOLIS MACHINE & BOLT WORKS.



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MANUFACTURERS OF

## MERCHANT BAR IRON,

SKELP IRON, SPLICE BARS,

Railway Track Bolts, Car, Bridge and Machinery Bolts, Nuts, &c.



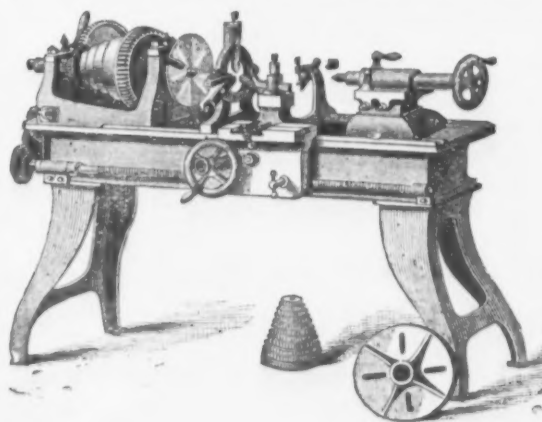
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Our works have been enlarged within a few years; all orders are now executed with promptness; all our work guaranteed.

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TOOL & MACHINE WORKS,

ENGINE, BRASS FINISHERS, WOOD TURNERS, AMATEURS' and JEWELERS' LATHES. Slide Rest, Screw Machines, Turret Heads, Screw Presses, Screw Clamps, Lathe Carriers, &c. 1422, 1424 & 1426 Callowhill St., Philadelphia, Pa. Israel H. Johnson, Jr.

## STEEL HOIST, UNDER Thompson's Patent.

NO WORM GEAR. NO FRICTION BRAKES.

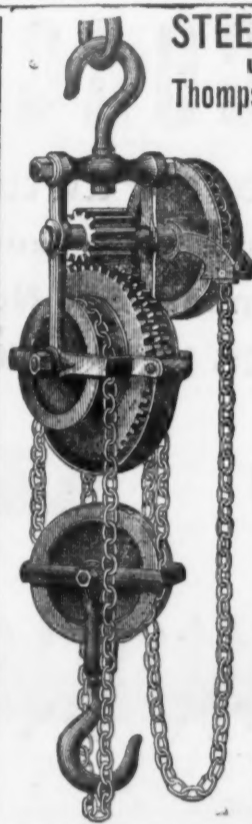
MADE OF Annealed Cast Steel AND Malleable Iron.

DOUBLE SPEED 1,000 to 40,000 Lbs. Capacity.

Sole Manufacturers in America.

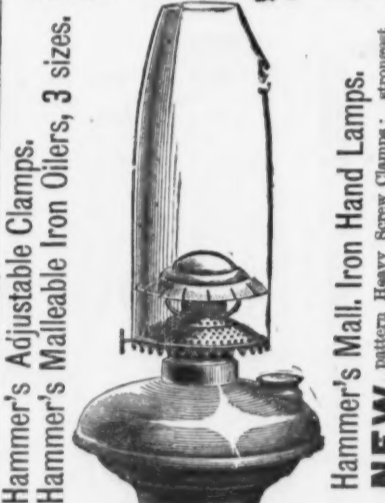
**Steel Hoist MFG. CO.**  
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Send for Catalogue English Patent For Sale.



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For Sale by all the principal Hardware Dealers. Send for price list.

Malleable Iron Castings of superior quality and Hardware Specialties in Malleable Iron made to order.

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Manufacturers of the ATWOOD SAFETY NUT



Designed for places of great strain and vibration. Only one nut is used. The nut will not break. It will not strip its thread. The bolt is always in perfect condition. The bolt will not loosen in its work. No washer or other auxiliary pieces needed. Is easily applied, and removed when necessary requires, without difficulty, in as perfect condition as when first put on.

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Hydraulic Elevators for Passengers or Freight. Hydraulic Double-Acting Dumb Waiters. Hydraulic Sidewalk Elevators. N. B.—Steam Elevators altered to Hydraulic Elevators.

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Also, Surface Gauges and Counter Sinks, Stevens' Patent Breech-Loading Sporting Rifles, double and single-barrel; Shot Guns, Pocket Rifles, Pocket Pistols, and the noted Hunters' Pet Rifles. Our Shooting Gallery Rifle is the favorite everywhere.



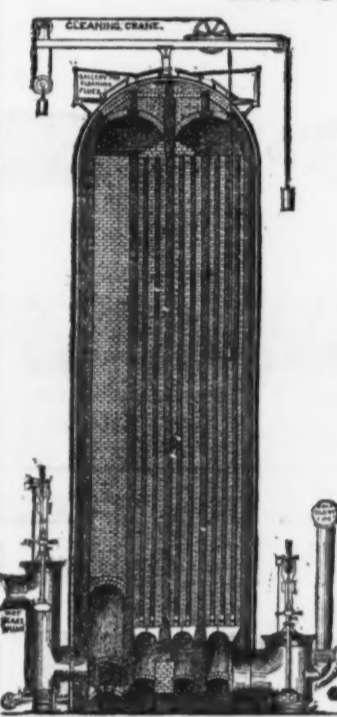
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Contract for erecting the same. Also, for Building and Replacing all types of Blast Furnaces. Combining Economy with Efficiency and Modern Improvements, wherein the output of Furnaces is increased fully 50 per cent, and the fuel consumption decreased in the same ratio.

Our Blast Engines, Hoisting Engines, &c., have no superior in strength of parts, duty or economy. We solicit an opportunity to make proposals on Blast Furnaces, Rolling Mill or Steel Works Machinery.



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Manufacturers of

**GARDEN TOOLS**

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Housekeeping Hardware

P. O. Address, Box 2703.

## IVES' PATENT

Burglar-Proof Door Bolts.

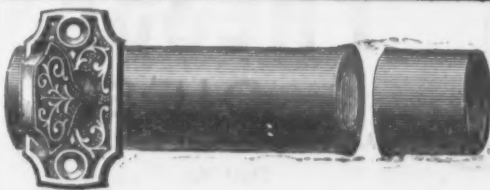
For sale by leading Hardware Jobbers throughout the country.

**HOBART B. IVES,**

Sole Manufacturer and Patentee,

187 St. John Street, NEW HAVEN, CONN., U. S. A.

Send for Illustrated Price List.



# DE-OXYDIZED BRONZE,

## PATENTED.

Is composed of **LAKE COPPER** and best **ASIATIC TIN** in any proportion required, so as to be either as ductile as copper, as tough as iron, or as hard as steel, according to the proportion of Copper and Tin used.

The process of making the alloy is what constitutes its superiority over any other known alloy of Copper and Tin or any other Bronze composition.

The castings made from this metal, owing to its perfect fluidity when melted, possess great density, perfect soundness and homogeneity. Unlike certain bronze and other compositions, it can be handled without the least difficulty by any ordinary founder, as it flows like oil in pouring.

**TENSILE STRENGTH OVER 90,000 POUNDS TO THE SQUARE INCH.**

We claim for it

1. **UNEQUALED ENDURANCE.**
2. **SUPERIOR ANTI-FRICTION QUALITIES** to any other known Bronze or Brass.
3. **GREAT MALLEABILITY AND TENACITY.**
4. **SUSCEPTIBILITY** of the **HIGHEST FINISH** on account of its homogeneity and smoothness of surface.
5. **JOURNAL BEARINGS** made of **D. O. B.** require **ONE-FOURTH** less **LUBRICATING MATERIAL** than any other metal yet known.
6. It is superior to all other bronze for the following purposes :
  1. Engine, Car, and Machinery Journals.
  2. Pumps, Valves and Linings, Cylinders, Pinions, Cogs, Plungers, Crank Pins, &c.
  3. Car Trimmings, Harness and Coach Furniture, House Hardware, Steam Fittings, &c.
  4. Wire Sheets, Rods and Tubes.
  5. Bells, Gongs, Ordinance, Boilers, Fire Boxes.
  6. Tuyeres (For this Purpose it has no equal).
7. **ART METAL WORK** it finishes as handsome as Gold.
8. **CHIMES AND PEALS OF BELLS.**

We are making a specialty of Chimes and Peals of Bells from 2000 pounds the Peal up to 25,000 pounds Chime of 9 Bells, or any greater weight or number of Bells. We also furnish small and large Bells singly of all descriptions. Send for Circular.

Henry Disston & Sons, Saw, Tool, Steel and File Works, Front and Laurel Streets, Philadelphia Smelting Company:

PHILADELPHIA, October 4, 1879.  
GENTLEMEN: After a trial of eighteen months of your "DE-OXYDIZED BRONZE" as Journal Boxes in our Rolling Mill, where great pressure is required, we take pleasure in recommending it as being superior to any we have heretofore used. Very truly,  
HENRY DISSTON & SONS.

Office of Eagle Iron Works, 1162 North Third Street, Philadelphia Smelting Company:  
PHILADELPHIA, August 29, 1879.

GENTLEMEN: In reply to yours of the 28th inst., we beg to say that we have been using your "DE-OXYDIZED BRONZE" for over a year, and have found it better than any composition boxes we have used; and as long as you continue to make it the same quality, we shall use no other metal in our Engine Boxes. We therefore take pleasure in recommending it to Engine Builders in general.  
Yours respectfully,  
HOFF, FONTAINE & ABBOTT.

Office of Union Brass Manufacturing Company,

CHICAGO, Dec. 23, 1880.

Philadelphia Smelting Company, Limited, Twelfth and Noble Streets, Philadelphia, Pa.:  
DEAR SIR: In reply to your inquiry of yesterday as to our opinion of "DE-OXYDIZED BRONZE" for Railway Coach Trimmings, I beg to submit that we have used it up to present writing for the trimming of something over 100 coaches. One marked peculiarity of this metal, when highly finished, is non-liability to abrasion, and its non-affinity with the gases of the atmosphere, which in embossed work is a great desideratum. To them willing to pay more in the first cost, we would confidently recommend "DE-OXYDIZED BRONZE" Trimmings as cheaper in the end.  
Yours very truly,  
J. HALL DOW, President.

Cowles Hardware Co., Manufacturers of Solid Bronze Butts and Blanks, Unionville, Conn., say:—  
"We use only 'DE-OXYDIZED BRONZE,' which is superior to any other metal known for our purposes, as it is of unequalled endurance in resisting friction and susceptible of the highest finish."

We can also refer to many large concerns, in addition to above, who are using it in preference to any other.

# DE-OXYDIZED COPPER.

We are making "PURE" Sheet Copper and WIRE. Its tensile strength is double that of ordinary Copper Sheet and Wire, and it is perfect in its texture.

# GENUINE BABBITT.

Our Genuine Babbitt is superior to all other makes in the market in every particular. We guarantee it to be perfect in its Anti-friction qualities in machinery AT A SPEED OF 10,000 PER MINUTE, or at 1000 TONS PRESSURE for 10 YEARS. We append below testimonials from A1 houses justifying us in the above claims.

WORCESTER, MASS., April 21, 1881.  
We have used your "Genuine Babbitt" about 4 years on our wood-cutting machinery bearings, run at a speed of 3000 revolutions per minute, and always with entire satisfaction.  
G. W. INGALLS & CO.

NEWARK, N. J., Dec. 10, 1881.  
Gents.—We have received word from our 5-ton forging machine. The Babbitt Metal Bearings in main shaft are 8 inches diameter by 14 inches long each, and in the Caps and Crank Bearing 8 x 14 inches. The machine strikes 18,000 blows daily making wrenches. It has run steadily for 2

years, and has never had a liner taken out in any part. The crank-shaft and parts on it weigh above 4000 pounds. The shaft makes about 250 revolutions per minute. Your Genuine Babbitt, now exclusively used by us, has given us the best satisfaction. We have tried almost all other makes in search of a good article.  
E. GOULD & EBERHARDT,  
Machinists' Tools, &c.

NEW HAVEN, CONN., April 11, 1881.  
We have used your "Genuine Babbitt" in our Challenge Rock Breaker with excellent results, and

are pleased to testify to its merits for Journals where high speed and great pressure are required.  
BLAKE CRUSHER CO.

WORCESTER, MASS., April 24, 1881.  
Having used your "Genuine Babbitt Metal" for over 4 years on machinery that runs over 9000 turns a minute, on 1 in. shaft, 3 in. journals, I can safely recommend it for all you advertise it to do. Any person wishing to see the machinery or wanting further information can call or address,  
A. I. THOMPSON, Master Mechanic,  
25 Hermon street.

From J. L. MARSDEN, Supt., FARRELL FOUNDRY AND MACHINE CO., ANSONIA, CONN., Aug. 17, 1880.

The "Genuine Babbitt" we have bought from you gives perfect satisfaction in our Stone Breakers. We have it working in bearings 12 in. long and 5 in. diameter. One-half the revolution of shaft there is a pressure of 900 tons. The other half 256 tons. The shaft makes from 200 to 250 turns per minute. I think this is a very severe test, yet they have been running for more than one year.

From WITHERBY, RUGG & RICHARDSON, Manufacturers of Wood-Working Machinery, WORCESTER, MASS., Nov. 20, 1880.

Send us 1000 pounds "Genuine Babbitt," divided into Bars, as usual. We think the continuance of our trade with you for the past 3 years, in the face of the constant effort made by other parties to divert our patronage, is a sufficient recommendation of your goods. We speed some journals as high as 6000. Yours truly,  
WITHERBY, RUGG & RICHARDSON

From this it will be seen that it can have no superior, or even equal, as an Anti-Friction Metal in anything manufactured. We make besides all grades of Anti-Friction Metals,

Letter A, Guaranteed at a speed of 2000.  
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All our Metals are made from best Lake Copper, Asiatic Tin, Cookson's Antimony and best Refined Lead, and in all cases run free at melting heat, without dressing, and without any necessity for heating the journals into which they are poured.

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## REAL BRONZE FINISHED.

Patterns from \$3 upwards, according to Size and Style.

Sketches furnished for approval before making Patterns.

We have a specialty in this line and produce a handsomer plate, at less money, than can be obtained elsewhere.

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EVERY RETAIL STOVE OR HARDWARE HOUSE IN THE U. S. CAN EASILY SELL DURING THE SEASON ONE OR MORE GROSS OF

THE

Recognized Standard of the World for Cleaning the  
Nickel Plates on Modern Stoves,

Upon many of which there is more Nickel than iron surface to clean. It is also sold  
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BEST AND QUICKEST CLEANER OF SILVERWARE EVER PRODUCED.  
PAYS 50 PER CENT. PROFIT.

Price, Per Dozen, \$2. Retail at 25 Cents Per Bottle.  
ORDER FROM THE WHOLESALE HOUSES.

MANUFACTURED ONLY BY

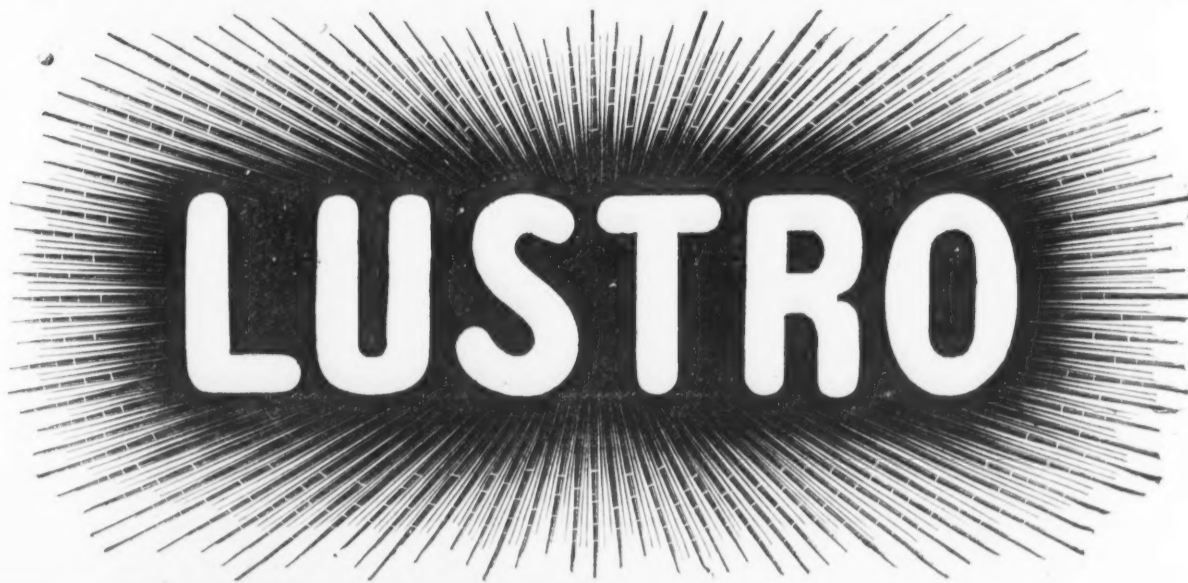
**THE LUSTRO CO.,**

171 Duane Street, New York.

FRED. W. GARDNER, President.

JOHN T. BROWN, Treasurer.

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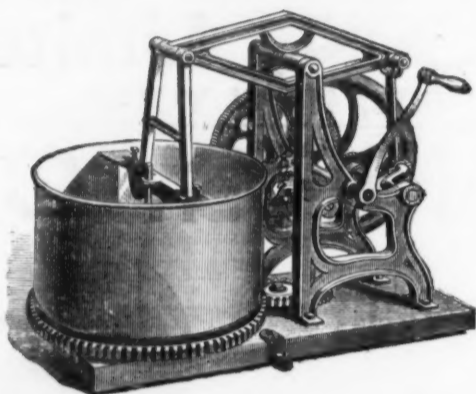


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**AMERICAN MEAT CHOPPER,**

SEVEN

SIZES.



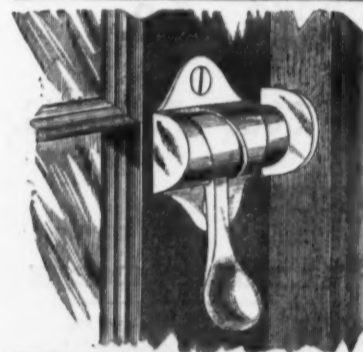
For Butchers and Family Use.

The only Chopper yet invented that has proved an unqualified success.

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SOLE MANUFACTURERS.

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Sole Manufacturers of the

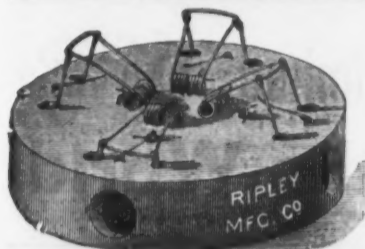
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WINDOW SASH FASTENER  
AND LOCK COMBINED.**

Holds the Window at any point, prevents all rattling,  
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Hoddard's Combined Dividers and Calipers, Improved  
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BEST IN MARKET.**

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CASES,**

Protects the Pistol from Perspiration.  
Prevents its Wearing the Pocket.  
Permits Instant Withdrawal.  
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SABIN'S LEVER DOOR SPRINGS, For heavy doors,

BOSS AND CROWN SPRINGS, For light doors.

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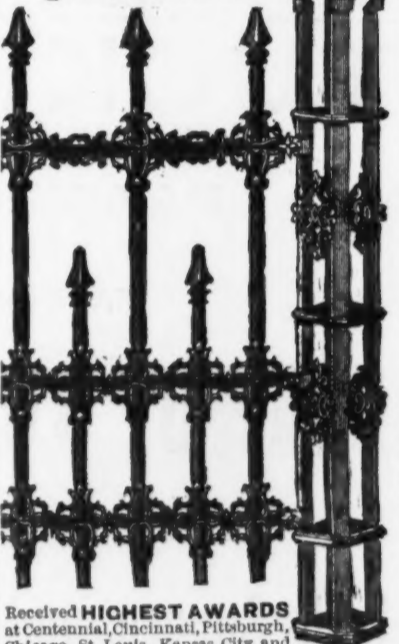
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IRON FENCE CO.**

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The most extensive Rail-  
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Received **HIGHEST AWARDS**  
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BEST PUMP MADE!**

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**Mineral Wool.**



A fibrous material, encasing about 90 per  
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**NON-CONDUCTOR**

OF

**HEAT AND SOUND.**

Being made from the slag of blast furnaces,  
it is fire-proof and durable in contact with  
heated surfaces. Readily applied.

Ordinary Grade, 21 lbs. per cubic foot.

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WIRE BENDING A SPECIALTY.

Wire Straightened and Cut to  
Length

CUTTERS WILL NOT BREAK.

THE DERBY BIT CO

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DURABLE. STRONG. CONVENIENT

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**THE LIGHTNING TAPS AND DIES**

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**LIGHTNING TAPER REAMERS**  
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Weight, 250 lbs.



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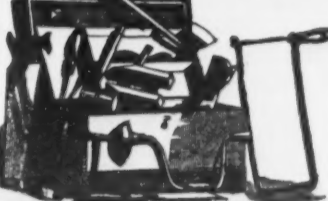
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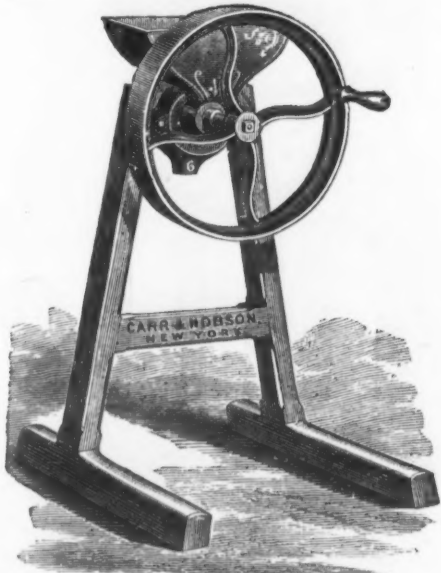


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No. 3 .....\$4.00 | No. 4.....\$5.00

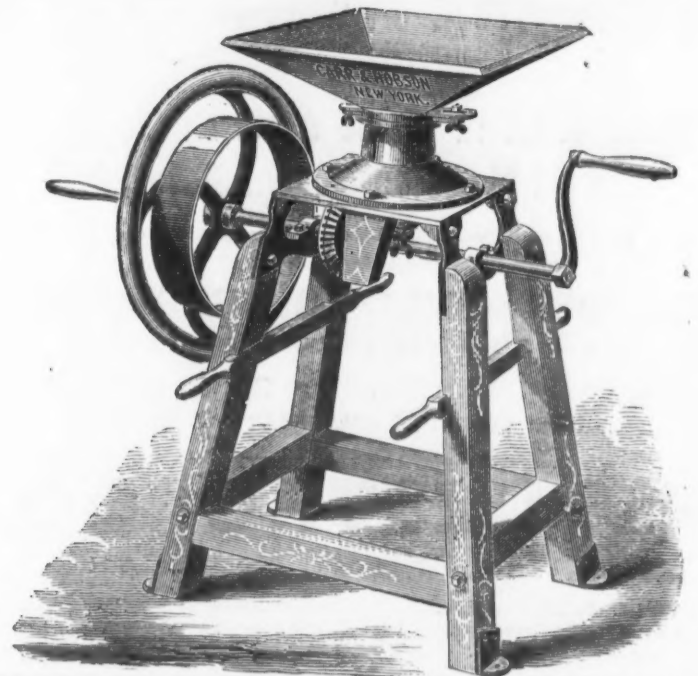
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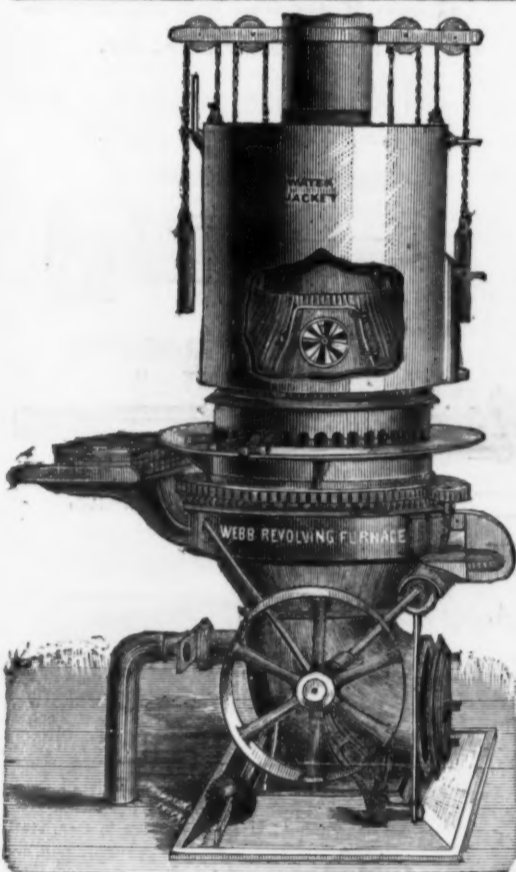
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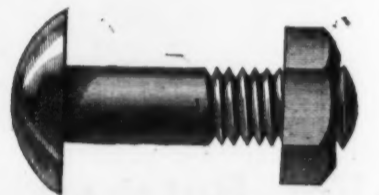
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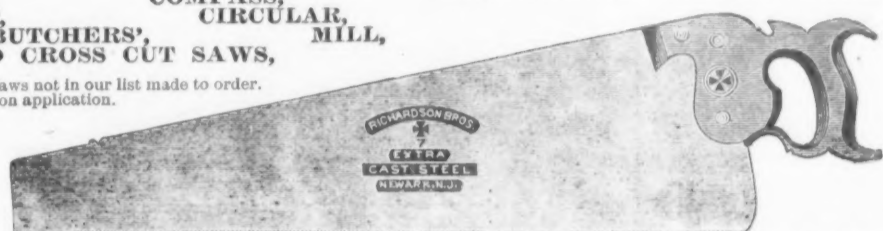
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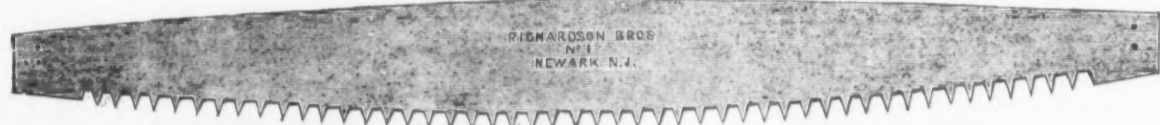
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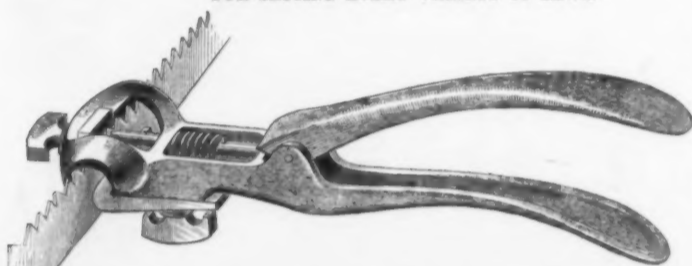
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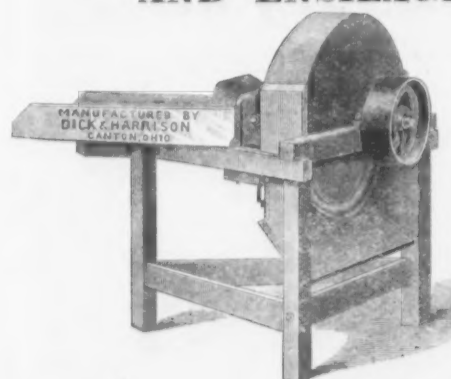
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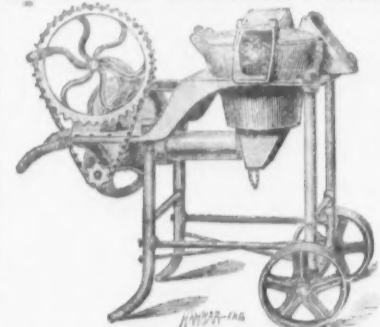


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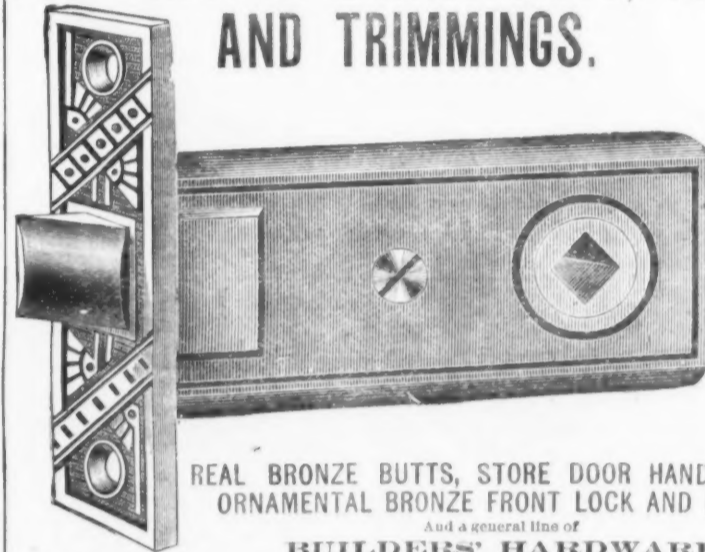
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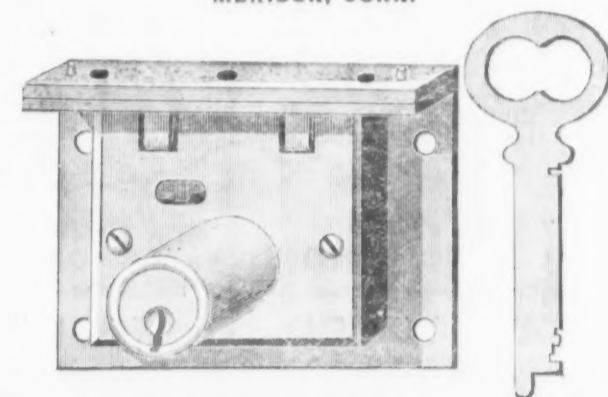
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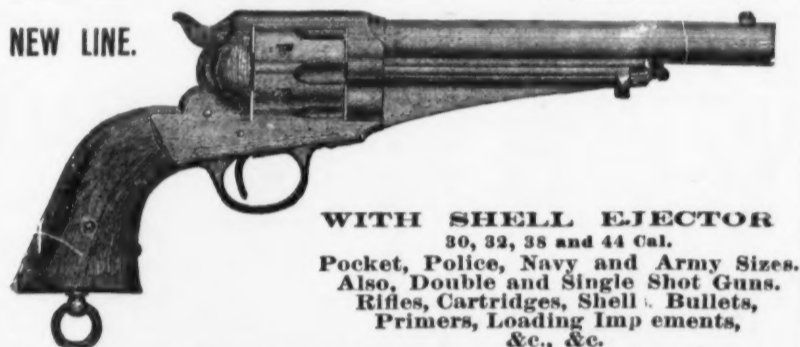
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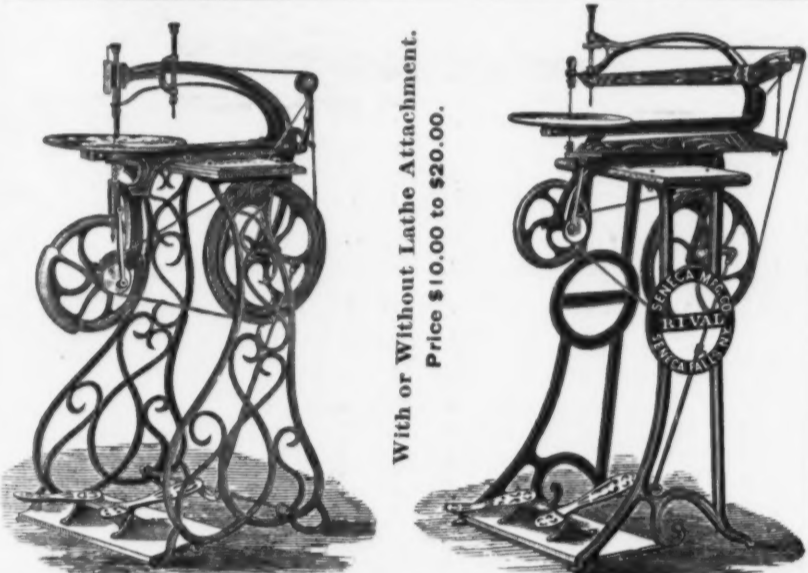
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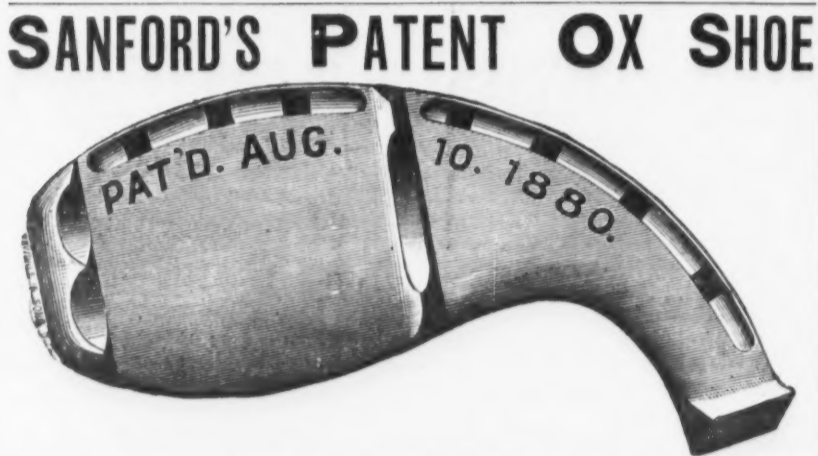
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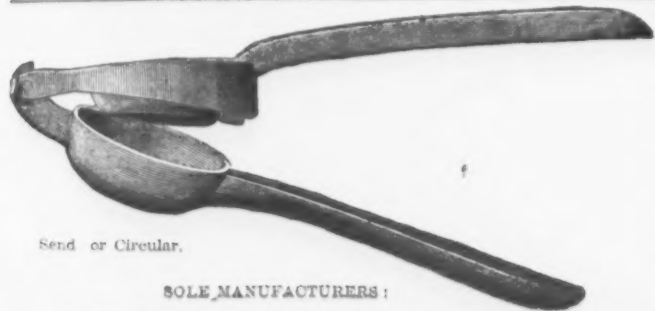
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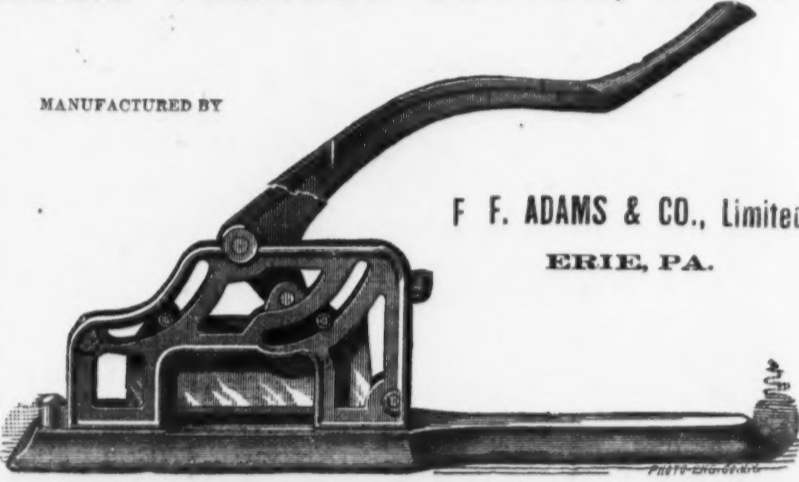
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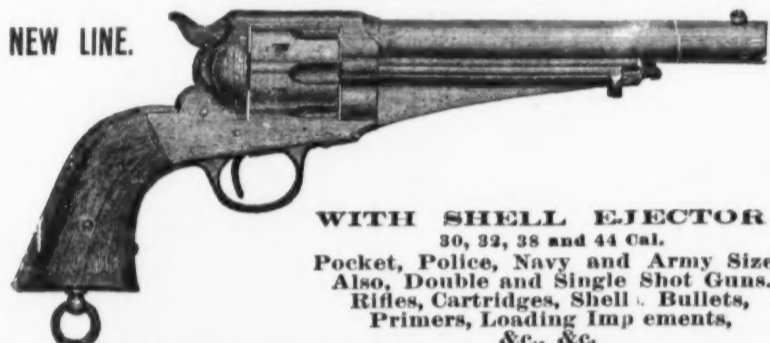
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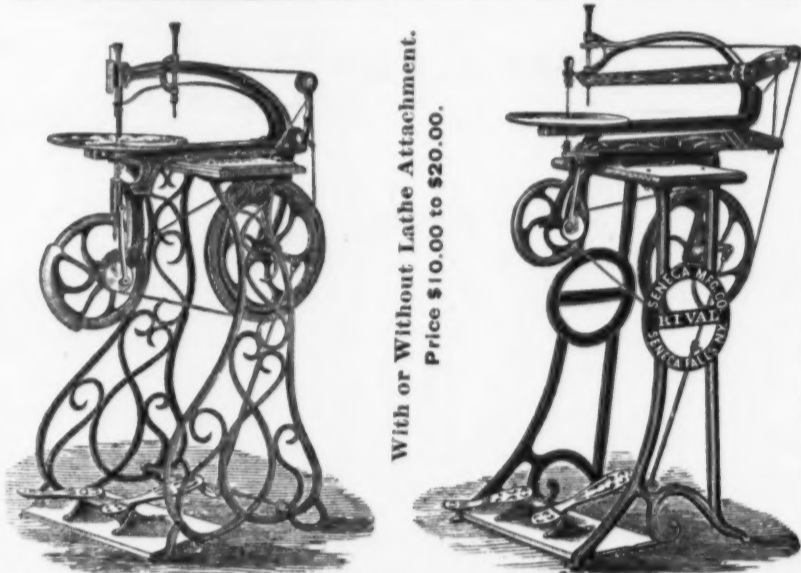
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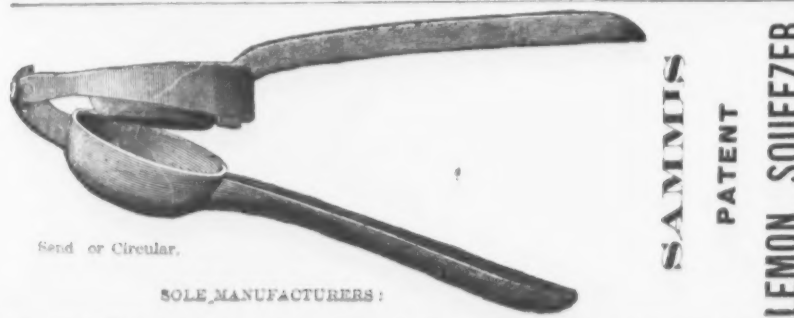
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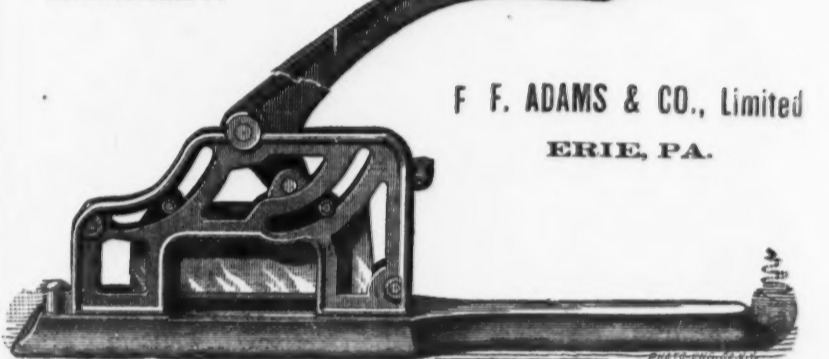
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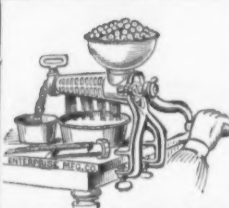

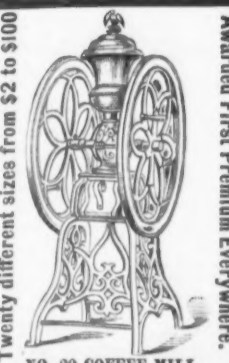

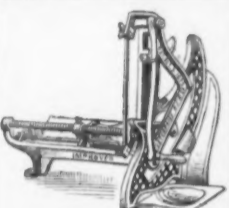

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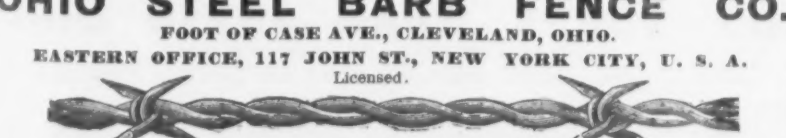


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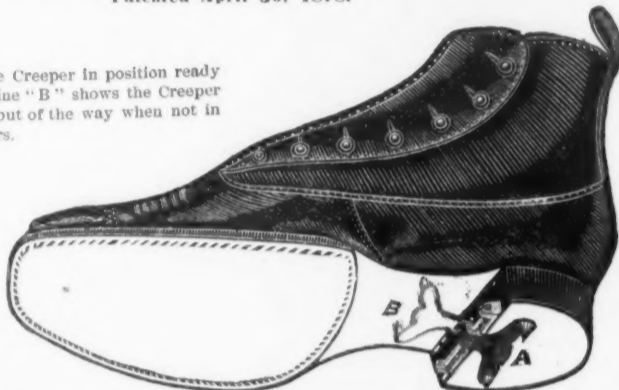
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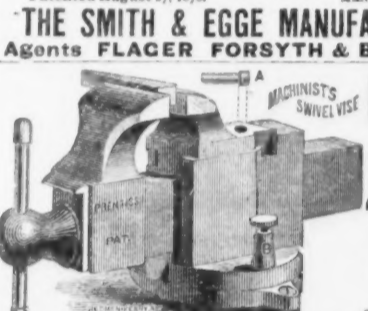


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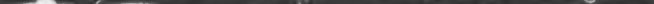
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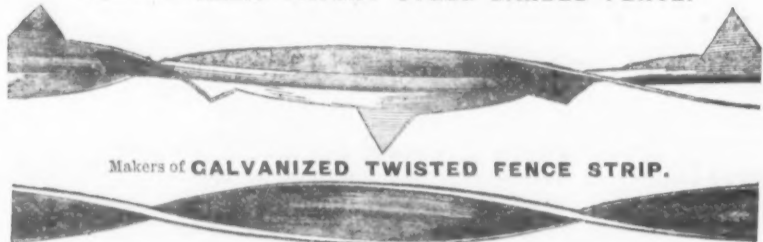
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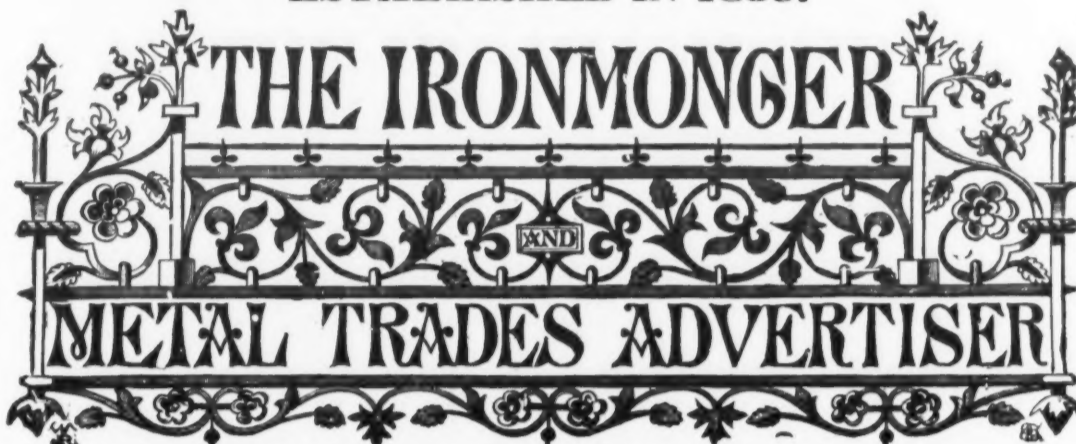
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be suitably described in four or more languages on the opposite or right page without illustrating.**THE WHOLE FOREIGN HARDWARE TRADE**so far as experience of more than twenty years is concerned, will be covered by THE FOREIGN SUPPLEMENT at least twice a year. Thus a Price List or  
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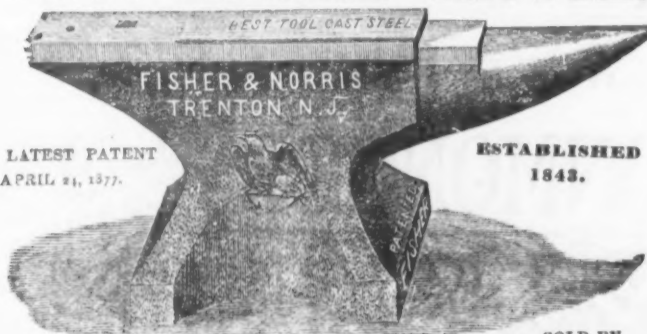
## THE STANDARD WOOD TRACK HANGER OF AMERICA.

For Sale by the Wholesale Trade  
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KIDDER SLIDE DOOR HANGER CO.

Sole Manufacturers,

ROMEO, MICHIGAN.

## THE "EAGLE" ANVIL.



LATEST PATENT  
APRIL 21, 1877.

ESTABLISHED  
1843.

## "KIDDER." WARRANTED!!

Better than the Best English Anvil.

Face in one piece, of BEST TOOL CAST STEEL. PERFECTLY WELDED, perfectly true; of hardest temper and never to come off or "settle." It does not bounce the hammer back, and therefore can do more work with lighter hammer. Horn of tough untempered steel, never to break or bend. Only Anvil made in United States fully warranted as above. None genuine without our trade-mark.

N. B.—That the "Eagle" Anvil is the only one made at Trenton, New Jersey, and it must not be mistaken for an Anvil in the market called Trenton, but which is really of foreign manufacture, and an imported imitation of the English Anvil.

SOLD BY

New York—RUSSELL & ERWIN MANUFACTURING COMPANY, DUBRIE & McCARTY, TENNIS & WILSON.  
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THE

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Will shell more corn with less labor than any other machine in market. The only sheller made that uses spiral springs for the pressure bar. Every machine warranted to do as good work as any sheller made. Ask to see the Cornell sheller, try it and you will buy no other. Address:

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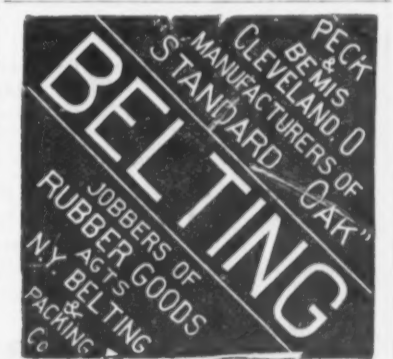
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Reversible, Self Sharpening and Other  
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A full stock of all Patterns. London, N. Y., Philadelphia, Boston, Lowell and Portland on hand. Every Trowel warranted.

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Has Self-Adjustable Foot Rest,  
NEW AUTOMATIC COMPENSATING  
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It will throw a continuous jet from  
FORTY TO SIXTY FEET. A new pattern  
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each pump.

Especially attention is called to the  
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in these pumps.

LIST PRICE, \$8.

THE NEW ENGLAND BUTT CO  
PROVIDENCE, R. I.

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These cuts represent  
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RED  
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Lift and Force  
PUMPS,

For General Purposes.



Highest Prizes  
awarded where  
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Thousands now  
in use throughout  
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perfect satisfaction.  
Fitted for hand  
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Also the

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THE WHITE MOUNTAIN FREEZER COMPANY are headquarters for Ice Cream Freezers and Ice Crushers, being the only firm in the United States who manufacture all parts of the raw material. The remaining Committee, consisting of 50,000 members of the United States have room-

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SPECIAL ATTENTION GIVEN TO EXPORT ORDERS.

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PECK'S DROP LIFTER is the only one which has its parts cushioned. Being thus cushioned they are the most durable Lifter in the market.

Can be attached to any drop now in use.

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Manufacturers of  
FINE GRAY IRON CASTINGS OF EVERY DESCRIPTION.  
Rosters and Pickets for Wire Workers, Castings for Furniture and Piano Manufacturers. Iron and Metal Patterns of all kinds a Specialty.  
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**Transom  
Lifter  
and Lock.**



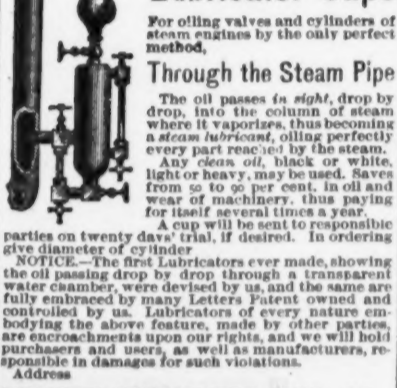
For all kinds  
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Skylights.

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Patentee and Sole Manufacturer,  
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NOTE.—In our recent suit against the American Lubricator Co. of Detroit, before Justice Stanley Matthews, of the U. S. Supreme Court, involving their light-oil feature, a decree was rendered in our favor August 20, 1891.

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**WITH CAP DIES.**

M. D. LUEHRS PATENT.

Double Automatic Bolt Cutters. Single Bolt Cutters, 1 in. to 4 in. Rapid Bolt Cutters, 1 in. to 4 in. Tappers, 3/4 in. to 1 1/2 in. Rapid Nut Tappers, 3/4 and 1 in. Spindles, Bolt Headers, four different styles. Bolt Pointers, Nut Presses, &c.

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SPORING POWDER KNOWS EVERYWHERE AS  
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The constantly increasing Sales of this Injector attests its Superiority as a Boiler

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 any kind until you write for Prices and Sam-  
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For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free.

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70 WALL ST., N.Y.

Reported by Macomber, Bigelow & Douse,  
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nvil & Vise.—

Shepardson's Double Gimlets.....dis 40 %  
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 Stearn's Extension Hollow Augers—  
 No. 2,  $\frac{1}{2}$  doz., \$45.00; No. 3,  $\frac{1}{2}$  doz., \$60.00 list. dis 20 %  
 Sonney's Extension Hollow Augers..... $\frac{1}{2}$  doz \$36.00  
 Pierce's Bits.....dis 40 %

Oak Handles.—			
Oak Extra, 31 in., No. A.....	per doz	\$3.15	
Oak Extra, 34 in., No. A.....	per doz	2.30	
Oak Extra, 31 in., No. B.....	per doz	1.75	
Oak Extra, 34 in., No. B.....	per doz	2.00	

Wrought Round..... $\frac{3}{4}$  ft.,  $\frac{3}{4}$ , 3c;  $\frac{7}{8}$ , 4c  
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 Hs.—Connel's Crank Gong, reduced list..dis 10 & 10 %  
 Card Cages.—  
 Annan M. B. & D., reduced list. 1870.....dis 40 %

nd Hinges.—Mall, Hook, 3 holes.... $\frac{1}{2}$  C sets 7.00  
nd Awl Handles.—  
Phoenix Adjustable..... $\frac{1}{2}$  doz \$2.00  
Its.—Norway Iron Carriage... ..dis 70¢10¢  
Common Iron Carriage.....dis 80¢5¢

aces.—Barber's.....	dis 40&5 %
Conford's.....	dis 40&5 %
Jackus'.....	dis 40&10 %
ucket Saws.—Holly Scroll Saw.....	each \$2.35

cket Saw Blades.—Griffith's pat....<sup>1</sup>/<sub>2</sub> gross 75c  
ackets.—  
B. & M. Flower Pot, reduced list.....dis 30 & 10 %  
ronzed Shelf, M. B. & D., new list.....dis 40 %  
ore Shelf.....dis 40 %

... ..	dis 65¢ 10%
<b>Frige Belts.</b> —Eagle Norway.....	dis 70¢ 10%
Common.....	dis 80¢ 5%
<b>Frige Jacks.</b> —Climax No. 1.....	per doz \$2.00

Universal No. 4.....each 6.00  
 Universal No. 5.....each 6.40  
 Cartridges.—U. S. Cartridge Co.....dis 70 %  
 Dis.—  
 Watson's make Horse & Curry dis 10 %

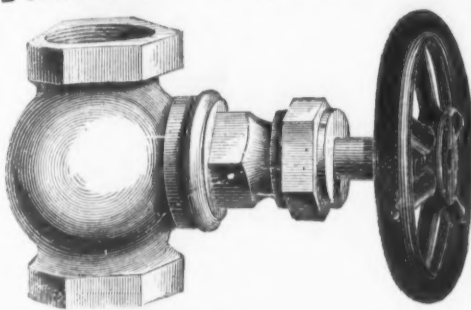
aces 8, 10, 4, twisted.....	pair 80c
aces 7, 12, 2, twisted.....	pair 80c
13-16.....	pair 10c
17-18.....	pair 10c
19-20.....	pair 8c
21-22.....	pair 60c
23-24.....	pair 60c

els.—Hart, Bliven & Mead, Framing.....	dis 60 & 10 & 10%
derhill, Framing.....	dis 25 %
ick's Chisels.....	dis 30 %
<b>Shaw Line.</b> —	
vanized Wire, 100 feet each.....	W DOG \$4.00

30, 3 ft. No. 6 Wire, with toggle.....	doz	3.80
30, 3 ft. No. 6 Wire, with snap.....	doz	4.00
40, 3 $\frac{1}{2}$ feet No. 6 Wire, with toggle.....	doz	4.30
40, 3 $\frac{1}{2}$ ft. No. 6 Wire, with snap.....	doz	4.50
50, 4 ft. No. 4 Wire with toggle.....	doz	4.75

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**McNab & Harlin Mfg. Co.,**  
MANUFACTURERS OF  
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For STEAM,  
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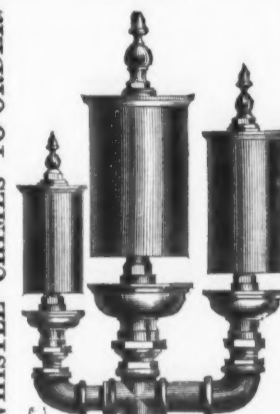



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AND ALL STYLES OF  
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**LIGHTNING HAY KNIVES.**  
WEYMOUTH'S PATENT.




This knife is the best in use for cutting down hay and straw in mow and stack, cutting fine feed from bale, cutting corn stalks for feed, cutting peat and ditching marshes.  
The blade is best cast steel, spring temper, easily sharpened, and is giving universal satisfaction. A few moments' trial will show its merits, and parties once using it are unwilling to do without it. Its sales are fast increasing for exports as well as home trade, and it seems destined to take the place of all other Hay Knives.  
They are nicely packed in boxes, one dozen each of 50 pounds weight, suitable for shipping by land or water to any part of the world.  
MANUFACTURED ONLY BY  
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For sale by the Hardware Trade generally.

**NORWAY IRON CARRIAGE & TIRE BOLTS.**  
**Axle Clips, &c.**  
Only Medal, Phila., 1876.



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The most durable Grate Bar on the market.  
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This is the only Stretcher made with a SELF-ADJUSTING SLOTTED LATCH that will adjust itself to the HATCHET, either side of the post, or at either end of the wire, or either side up, the crank turning at all times in one direction, which is necessary, for reversing the crank would reverse the rope. Stretchers so constructed that the latch will drop down, except when in a certain position, are well high, yes, quite worthless.  
Hook the eccentric at the end of the rope to the wire, now wind up and a little child can break any wire ever made. For splicing wire, place one end of the wire under the 110 eccentric on the frame, and the other end to slip eccentric at end of rope; now draw them together and splice. For raising hogs, cattle or any other weight it is indispensable. It is far superior to a hook fastened to one side of the post as, when the ground is wet, the strain being on one side, has a tendency to loosen and turn the post. This Stretcher BEING FASTENED TO THE POST, it is not necessary for one man to HOLD IT UP while another operates it, and follows it en route to the post. One man standing at the post operates the LITTLE GIANT alone, and very easily.  
Price \$1.50 Each. Discount to the Trade.  
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Cables and Barbs warranted all steel.  
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Straightening and Cutting Wire**  
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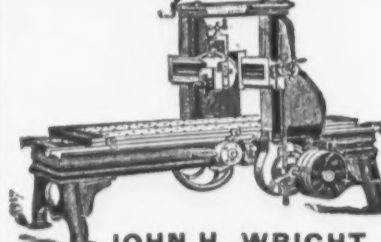
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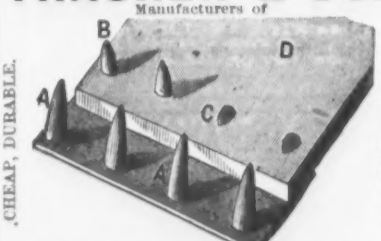
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Manufacturers of  
**Rotary Steam Fire Engines**  
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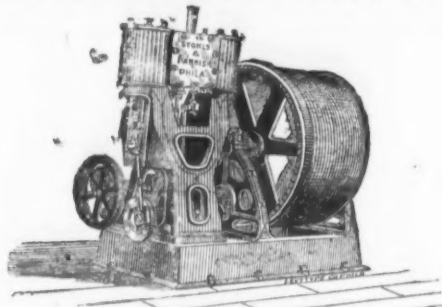
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From the late Wood, Light & Co.'s Patterns  
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PUMPS, CRISTMILL MACHINERY,  
Etc., FULLY DESCRIBED, AND  
PRICES ANNEXED.

Send stamp for same.

In our List No. 23.

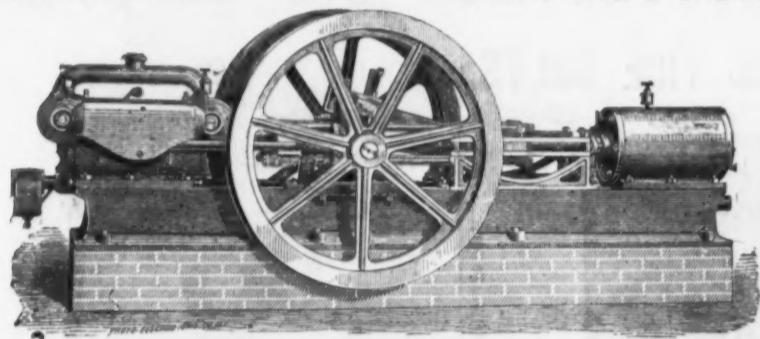
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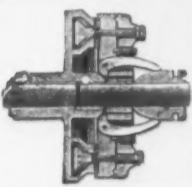
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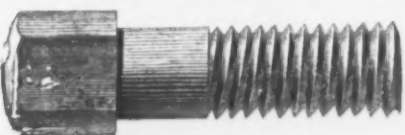
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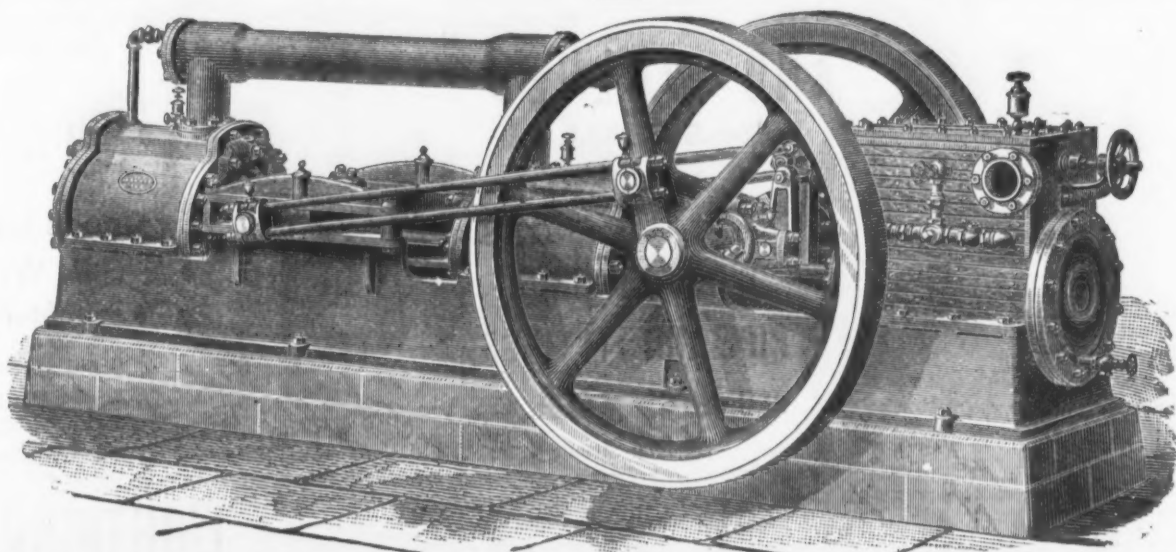
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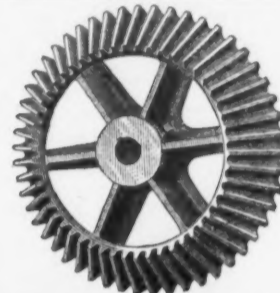
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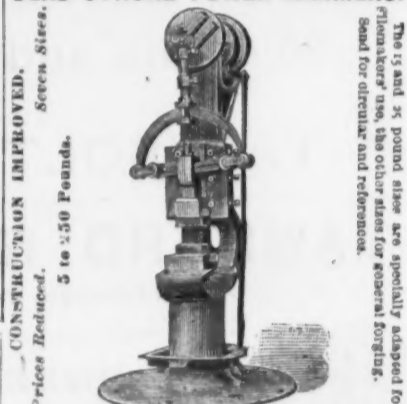
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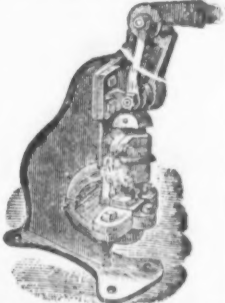
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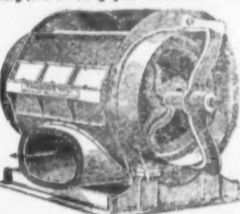
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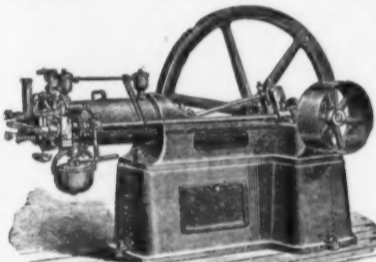
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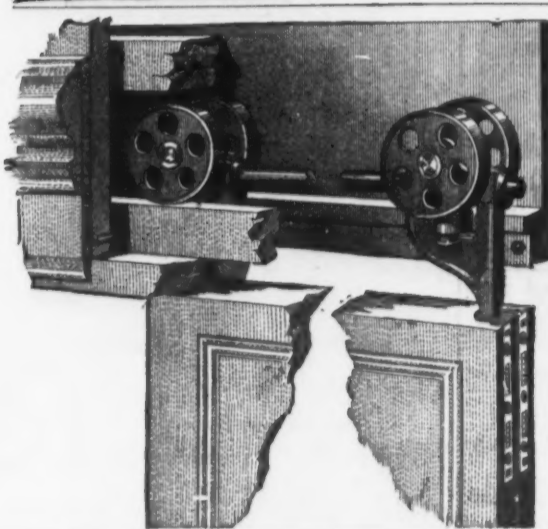
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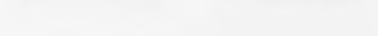
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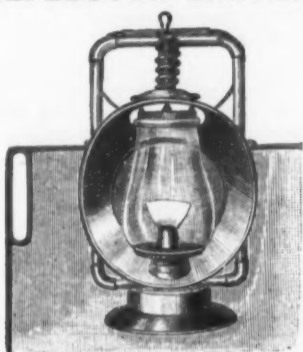
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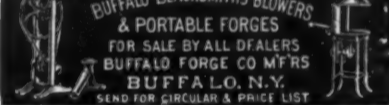
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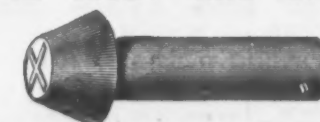
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